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MURPHY (P. A.) & MCKAY (R.). **Further observations and experiments on the origin and control of Onion mildew.**— *Journ. Dept. Agric. Ireland*, xxxi, 1, pp. 60–76, 1 pl., 1 diag., 1932.

Further investigations [the results of which are fully discussed and tabulated] have been made on the source of mildew [*Peronospora schleideni*] infection in the onion crop at Glasnevin, Dublin [*R.A.M.*, vi, p. 138]. From 1926 to 1929, inclusive, infection was found to have originated from autumn-sown onions that had contracted the disease in the seedling stage from the previous season's spring onion crop, while in 1930 a virulent attack of mildew involving 90 per cent. of the stand was due to soil contamination in the spring.

Early sowing of the autumn crop near diseased spring onions favoured seedling infection, and even when sown at the normal time late in August the crop became mildewed unless the sources of infection were destroyed before the emergence of the seedlings. Sowing at a distance of 500 yards from mildewed onions prevented the development of infection, as did sowing under glass in spring. The occurrence of one infected seedling per thousand in autumn-sown onions in May resulted in a serious outbreak of mildew affecting a quarter or more of the crop. The early removal of such infection centres either suppressed the disease entirely or considerably postponed its development.

The resting spores of the fungus were found in profusion in the leaves and flowering shoots in certain years, but almost entirely negative results were given by germination tests. These organs were shown to survive in the soil in an ungerminated state for at least three years, and proof was obtained in a controlled experiment that naturally contaminated soil freely conveyed the mildew to seedling onions. The fungus is further conveyed through the air by means of conidia during the growing season, but these organs are delicate and short-lived, so that in general the disease was found to remain confined to the neighbourhood of primary outbreaks, at any rate until late in the season. No evidence of seed infection was detected, in spite of flower invasion. When the flowering shoot was attacked the plants failed to set seed.

Observations on varietal reaction to *P. schleideni* indicated that Cranston's Excelsior and Up-to-Date are both resistant as regards

foliage, and the latter also in the bulbs; Bedfordshire Champion and James's Keeping are susceptible in the foliage, but the bulbs of the former consistently showed fair resistance; Ailsa Craig occupies an intermediate position. Of the varieties tested only in two years, Sterling Exhibition and All-the-Year-Round were somewhat susceptible, while one year's observations indicated that Magnum Bonum is also moderately susceptible, Rousham Park Hero intermediate, and Blood Red, Rijnsburger Ui Selected, Roode Ui Selected, and Wethersfield Red distinctly susceptible.

P. schleideni was destroyed by the exposure of infected bulbs to dry heat at 40°, 43°, and 45° C for periods varying according to the size, number, and variety of the bulbs. Under the conditions of the tests, heating for 24 hours at 40° or 43° and for eight at 45° was fully effective.

VAN DER MUYZENBERG (E. W. B.). **Onderzoek over Cladosporium cucumerinum Ellis & Arthur (de veroorzaker van het vruchtvuur van de Komkommer).** [A study on *Cladosporium cucumerinum* Ellis & Arthur (the agent of fruit blight of Cucumber).]—*Tijdschr. over Plantenziekten*, xxxviii, 5, pp. 81–96; 6, pp. 97–118, 3 pl., 1 graph, 1932. [English summary.]

A comprehensive and fully tabulated account is given of the writer's studies in Holland on the fruit blight of cucumbers caused by *Cladosporium cucumerinum* [*R.A.M.*, vii, p. 6]. The symptoms of the disease are described in detail, with notes on its geographical distribution. The optimum temperature for the development of the fungus was found to be about 21° C., with a minimum and maximum of ±0° and ±32°, respectively. Overwintering takes place in the soil or on the framework of the beds or glasshouses, and possibly on rare occasions in the seed coat. The conidia, which are mostly unicellular (22 out of 3709 were bicellular), are disseminated through the air.

Varietal reaction experiments were carried out on plants raised from seed obtained from Holland, the United States, Germany, England, France, and Italy. A few of the French varieties showed a considerable degree of resistance, but in shape and size the fruits of these sorts do not meet the Dutch commercial requirements.

The results of inoculation tests showed that at 35° to 40° germination is quite satisfactory and the young plants remain free from infection. At 30° slight infection was observed, at 25° it was moderately severe, while at 20° the seedlings were totally destroyed by the fungus. On seedlings kept at a temperature of 22° with a relative humidity of 70 to 80 per cent. scarcely any infection occurred, whereas in a fully saturated atmosphere the young growing parts of the plants were liable to very severe attacks. At 20° the incubation period was three to four days.

In order to kill *C. cucumerinum* in the soil, a 0·4 per cent. formalin solution should be applied at the rate of about 10 l. per 3·54 sq. m., followed after a few hours by the same amount of water. Glass, framework, and the like should be treated with 2 per cent. formalin, while in frames disinfection with burning

sulphur or with formaldehyde gas may be practised [cf. ibid., x, p. 631]. All rotting plant débris should be promptly collected and burnt. Suspected seed should be immersed for 30 minutes in 0·5 per cent. uspulun, solbar, or germisan. In addition to the regulation of temperature and atmospheric humidity as indicated above, the application at weekly, subsequently fortnightly intervals, to the young plants of 0·25 per cent. uspulun or solbar (for the later stages 0·5 per cent. of the latter) has given promising results.

GLEISBERG (J.). **Erkrankung der Rhabarberkulturen durch 'Rhizoctonia violacea'.** [A pathological condition of Rhubarb cultures due to *Rhizoctonia violacea*.]—*Obst- und Gemüsebau*, lxxviii, 5, pp. 76–77, 1932.

Rhubarb stands in the Lower Rhine province (Germany) have recently been affected by a disease characterized by general stunting of the plants and the production of small, red leaves. The roots bore the greyish-purple mycelium of *Rhizoctonia violacea* [*Helicobasidium purpureum*: *R.A.M.*, x, p. 692], to which the disease and ultimate death of the plants is attributed. The American Giant variety and all vigorous plants receiving a well-balanced fertilizer escaped the attack. Young, healthy mother plants should be used for propagation, the stands should be renewed at relatively frequent intervals, not left for 20 years as in the locality under observation, and phosphatic fertilizers should be applied.

FAJARDO (T. G.) & MARAÑON (J.). **The mosaic disease of Sincamas, Pachyrrhizus erosus (Linnaeus) Urban.**—*Philipp. Journ. of Sci.*, xlviii, 2, pp. 129–142, 6 pl., 1932.

Particulars are given of a mosaic disease characterized by chlorosis or mottling together with blistering of the leaves (which may be much reduced in size and have a twisted appearance) of sincamas (*Pachyrrhizus erosus*) [*P. angulatus*] reported for the first time from the Philippine Islands [*R.A.M.*, xi, p. 285]. From 30 to 100 per cent. infection has been found both on cultivated varieties and wild plants in Luzon. The virus is systemic, occurring in all the aerial organs including the seed, and also in the fleshy tap-root for which the plant is cultivated, infection being naturally transmitted through the seed and roots. Artificial transmission by the leaf mutilation method of inoculation was successful, but not through the soil or by root contact. The incubation period is about 10 or 15 days and young expanding leaves showing the first symptoms may become thick, stiff, and chlorotic. The mealy bug, *Ferrisia virgata*, commonly found on this plant, appears to play no part in the transmission of the mosaic. The plants are usually stunted or spindly when infection occurs early or is transmitted through the seed, but the presence of the virus does not seem to reduce the vitality of the seeds or shoots arising from infected fleshy roots. Chemical analyses showed that the diseased fleshy roots have lower percentages of reducing and total sugars, pentosans, and dry matter than healthy ones, while the starch percentage is higher in the former. The juice of diseased fleshy roots is less acid than that of healthy ones. Control measures should

be based on careful selection of healthy plants for seed production, early roguing of mosaic individuals, and the development of resistant varieties.

FAES (H.), STAEHELIN (M.), & BOVEY (P.). **La lutte contre les parasites de la Vigne, champignons et insectes, en 1930 et 1931.** [The campaign against fungous and insect parasites of the Vine in 1930 and 1931.]—*Ann. Agric. de la Suisse*, xxxiii, 1, pp. 1–34, 4 figs., 1932.

The meteorological conditions prevailing in Switzerland during 1930 were extremely conducive to the development of vine mildew (*Plasmopara viticola*), which first appeared during the latter part of June and spread rapidly from the beginning of July onwards in a particularly virulent form. In the autumn some hundred oospores could be counted per sq. mm. of leaf surface. Excellent control was again given by eight applications of Bordeaux mixture [*R.A.M.*, xi, p. 24], with or without a standard spreader, interspersed with copper dusts, e.g., Horst's [ibid., x, p. 582] and nosperit, which are ineffectual alone but confer additional protection on the fruit when used from the time of flowering onwards. Colloidal copper preparations, used at low concentrations, failed to give adequate control.

In 1931 little damage was caused by *P. viticola*, but *Botrytis* [*cinerea*] was responsible for heavy losses. The causal organism of coître (*Coniothyrium*) [*diplodiella*] was found to retain its germinative capacity and virulence for at least eleven years. It was experimentally shown that the mycelium of this fungus requires 48 hours to penetrate the pedicels of the grapes, so that the injury from this source may be greatly minimized, in small vineyards, by the removal, within 48 hours of a hailstorm, of wounded grapes with 1 to 2 cm. of their pedicels.

CORNELI (E.). **Sulle previsioni peronosporiche nell'Italia Centrale.** [On mildew warnings in central Italy.]—*Riv. Pat. Veg.*, xxii, 1–2, pp. 1–9, 1932.

Using Lambrecht's polymeter, by which the dew point can be estimated, records were taken during 1930–1 at two localities in the vicinity of Perugia, Italy, where severe attacks of vine mildew (*Plasmopara viticola*) are liable to occur. It was thought that if the dew point (the temperature which brings about favourable conditions for the germination of the zoospores by condensing the moisture in the atmosphere) was higher than 12° C., the lowest temperature at which germination takes place [*R.A.M.*, x, p. 432], an outbreak might be expected.

From the observations made the author concludes that under the conditions prevailing in central Italy, where the average daily temperature in late spring and summer favours infection, the predominating factor conducing to an attack is always the presence of condensed moisture. The saturation point itself, however, is of very little importance in forecasting an outbreak, as this invariably indicated that an attack was likely, since the temperature is nearly always high at such times and the hygrometric degree generally low. The safest procedure in forecasting

vine mildew is to note the changes in atmospheric humidity and temperature, using a thermometer and a psychrometer, and complete these data by direct observations of conditions leading to the condensation of moisture.

VIALA (P.). **Un parasite du mildiou de la Vigne.** [A parasite of Vine mildew.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 19, pp. 654–656, 1932.

As early as 1887, the writer observed in New Jersey that the white patches of the vine mildew fungus (*Plasmopara viticola*) were coloured brick-red by the development of another fungus. Together with P. Marsais, a similar phenomenon was noted in France in the years of the severe mildew epidemics, 1915, 1928, and 1930. The fungus was identified as a species of *Trichothecium* to which the name *T. plasmoparae* is given but without a technical diagnosis. Its slender mycelium surrounds the conidiophores of *P. viticola* and eventually suppresses them by its rapid growth, but it does not penetrate the leaf tissue. *T. plasmoparae* grows best at 18° to 25°, with a minimum at –7° to –10° and a maximum at 37° to 39°. [This paper is reprinted in *Rev. de Vitic.*, lxxvi, 1980, pp. 357–359, 1932.]

RAVAZ [L.]. **La lutte contre le mildiou.** [The campaign against mildew.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 23, pp. 783–785, 1932.

Promising results are stated to have been given in preliminary laboratory tests in the control of *Plasmopara viticola* on the vine by Viala's mildew parasite [*Trichothecium plasmoparae*: see preceding abstract], and a study of its practical applications is projected.

SEMICHON (J.). **Traitement simultané de l'Oidium et du mildiou par le permanganate et par le verdet.** [Simultaneous treatment of *Oidium* and mildew by permanganate and copper acetate.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 17, pp. 598–599, 1932.

In well or stream water (non-stagnant) up to 25° C. and at the ordinary concentrations of 125 to 500 gm. per hectol., potassium permanganate does not begin to exert a decomposing action on neutral crystallized copper acetate (500 to 1,000 gm. per hectol.) until six hours after contact. Contrary to the general opinion, therefore, these two substances may be applied simultaneously to vines for the control of *Oidium* [*Uncinula necator*] and mildew [*Plasmopara viticola*], respectively [*R.A.M.*, v, p. 14; ix, p. 286]. The permanganate is immediately reduced by the organic matter in the green organs of the vine, or by the mycelium of the fungi, and does not interfere with the copper acetate which exercises its usual destructive action on *P. viticola*.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1930. [Diseases and pests of cultivated plants in the year 1930.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 44, 50 pp., 2 graphs, 38 maps, 1932.

This survey of the fungous diseases and insect pests attacking

cultivated plants in Germany in 1930 is compiled on the same lines as the previous report [*R.A.M.*, xi, p. 559].

Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1929 und 1930. [Report of the Federal Experiment Station for Fruit Growing, Viticulture, and Horticulture at Wädenswil for the years 1929 and 1930.]—*Landw. Jahrb. der Schweiz*, xlvi, 4, pp. 497–592, 3 figs., 5 diags., 1 graph, 2 plans, 1932.

The following are some of the references of phytopathological interest occurring in this report. Osterwalder describes the results of experiments at Wädenswil, Switzerland, in 1929–30 on the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*], white spot of pears (*Mycosphaerella sentina*) [*R.A.M.*, ix, p. 461], and shot hole of cherries (*Clasterosporium carpophilum*) [ibid., ix, p. 467]. Notes are also given on the spotting of unripe apples caused by *Stemphylium maculans* [ibid., x, p. 113], and on the so-called 'Rigi cherry disease', an infectious chlorosis that has been spreading on a tree of the Rigi variety for the last seven years. The chlorosis is of the 'powdery' or spotted type of variegation and the affected leaves show histological changes indicating that they must become diseased while still in the bud. The same disease has been observed on cherry trees near Wädenswil as well as in the cantons of Schwyz and Bern.

Good control of the disease of tulip bulbs caused by *Sclerotium tuliparum* [ibid., xi, p. 376] was given by soil disinfection with uspulun (150 gm. in 20 l. water per sq. m.). Rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xi, p. 578] yielded to two dormant treatments with 8 per cent. carbolineum on 3rd November and 1st April—the latter, however, should have been given earlier to avoid burning of the foliage. One application of 0·5 per cent. kukaka on 19th June was effective against *Actinonema* [*Diplocarpon*] *rosae* [ibid., xi, p. 375], but this preparation has the drawback of injuring the leaves [cf. ibid., ix, p. 465]. The sole treatment so far efficacious in the control of raspberry cane blight (*Didymella applanata*) [ibid., iv, p. 258] on the Preussen and Lloyd George varieties is a summer application of 1·5 per cent. Bordeaux mixture.

GARBOWSKI (L.). **Spostrzeżenia nad chorobami roślin uprawnych w Wielkopolsce i na Pomorzu w okresie 1928–1931 r.** [Observations on diseases of cultivated plants in Great Poland and Pomerania during the period 1928–31.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy.* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz*], 11, pp. 3–50, 4 pl., 1932. [French summary.]

In this report brief notes are given on the more rare or economically important physiological and parasitic diseases which were observed from 1928 to 1931 on cultivated crops in Western Poland [cf. *R.A.M.*, viii, p. 290], among which the following may be mentioned. In one locality rye was found to be infected, in association with *Calonectria graminicola*, by a species of *Hel-*

minthosporium morphologically similar to *H. tritici-repentis* as described and figured by Drechsler [ibid., iii, p. 65], and with which it is provisionally identified though not previously recorded on this host. This identification is supported by the fact that the organism was also found on couch grass [*Agropyron repens*] growing in the midst of the infected rye, suggesting its passage from the former to the latter.

Latin diagnoses are given of two species of fungi which are considered to be new to science, namely, *Cytospora calvillae*, isolated from the surface of a few under-developed Adersleber Calville apples, and *Fusoma persicae*, isolated from dead young shoots of peach trees; the pathogenicity of these organisms has not been established.

Plant pathology.—*Twenty-sixth Ann. Rept. Dept. of Agric. British Columbia, for the year 1931*, pp. U 14–U 17, 1932.

Notes are given on the prevalence of a number of plant diseases in British Columbia during 1931 [cf. *R.A.M.*, x, p. 776], and on the experimental work of the Department's Plant Pathologists [J. W. Eastham and his colleagues] during the year.

NATTRASS (R. M.). **Annual Report of the Mycologist for 1931.**—*Ann. Rept. Dept. of Agric. Cyprus for the year 1931*, pp. 56–64, 2 figs., 1932.

In February and March, 1931, early-sown cumin (*Cuminum cyminum*) in Cyprus showed a disease of the collar and main root constantly associated with a *Stemphylium*; the fungus was invariably isolated from diseased tissue and sometimes the mycelium could be seen investing the plant at ground level. The affected plants had a characteristic appearance, a browning and wilting of the upper parts occurring in the early stages. As the disease progressed the affected plants collapsed in a manner resembling damping-off. The crops sown later were only slightly attacked.

An exceptionally severe epidemic of lentil rust (*Uromyces fabae*) broke out in the Larnaca district in April, infection extending over a wide area and in places completely destroying the crop.

Flag smut of wheat (*Urocystis tritici*) was generally distributed, especially in the west. It is probably of considerable economic importance, but does not appear to have been recognized by the farmers as a definite disease.

In most of the potato-growing areas the autumn crop suffered in August and September from a wilt which occurred sporadically in otherwise healthy crops. Part or the whole of the plants suddenly wilted, the wilting being quickly followed by death. The symptoms corresponded with those caused by *Fusarium eumartii* [*R.A.M.*, x, p. 13], but of the two strains of *Fusarium* that were isolated, the one which was ascertained to cause rotting of potato tubers proved to be another species. It had 3- to 4-septate (predominantly 3-septate) conidia as long as those of *F. solani* [ibid., x, p. 450] but rather narrower than those of typical strains and corresponding better with the measurements of *F. solani* var. *minus*.

A number of orange trees on sweet lime (*Citrus aurantifolia*) stock were destroyed by *Armillaria mellea*, while *Colletotrichum gloeosporioides* caused a rot of mandarin fruits [*C. nobilis* var. *deliciosa*] while still on the tree, and *Dothiorella ribis* [ibid., ix, p. 106] was associated with a die-back of lemon twigs. A *Phomopsis* was isolated from a foot rot of orange on sweet lime stock. The A spores measured 6 to 8 by 2 to 2·5 μ and the B spores 20 to 24 by approximately 7 μ.

Cucurbits and melons were extensively attacked by *Erysiphe cichoracearum*, while watermelons, pumpkins, and *Capsicum* [*annuum*] developed a fruit rot caused by *Brachycladium spiciferum* Bain. The spore measurements of the last-named fungus on the three hosts, respectively, were 32 to 40 by 12 to 14 μ, 29 to 37 by 10 to 15 μ, and 26 to 40 by 9 to 14 μ. A long-beaked *Alternaria* caused a rot of ripe watermelons and was determined at the Imperial Mycological Institute, after comparison with the type, as *A. cucumerina* (Ell. & Everh.) Elliott, with which *A. brassicae* var. *nigrescens* as distributed in Briosi & Cavara's 'Funghi parassiti' No. 422 is considered, in agreement with Elliott, to be identical [cf. ibid., v, p. 471]. The Cyprus fungus has rather smaller conidia than either of these, but the difference is not considered to be specific. In culture it appears to be very similar to *A. macrospora* Zimm. from cotton [ibid., viii, p. 171].

Other records of interest include a species of *Oidiopsis* common on eggplant and tomato, and non-sporing yeast-like fungi of the *Candida* type which caused an active rot of pears and figs still on the trees.

DADE (H. A.) & WRIGHT (J.). **Minor records, division of mycology.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 248–250, 1931.

The following are amongst the diseases recorded in the Gold Coast for the first time in 1930. A previously undescribed form of *Aspergillus flavus*, developing black sclerotia in culture, was parasitic on locusts (*Locusta migratoria migratorioides*). A bacterial blight of sorghum caused the stems to turn red and black and then collapse; the tissues were decomposed and the rotting stalks packed with bacteria. The disease agrees with the bacterial blight [generally attributed to *Bacillus sorghi* Burrill] known in other countries. *Phyllosticta colocasiae* caused a leaf spot of Amankani coco-yams [*Xanthosoma sagittifolium*], the same spots developing on plants in pots containing soil deficient in potash. A root rot of tree tomatoes (*Cyphomandra betacea*) was due to *Phytophthora parasitica*; the disease travelled up the stem, causing a brown discoloration of the cortical tissues, to which the fungus was confined.

Other records include *Corticium vagum* [*C. solani*] causing a collar rot of French beans [*Phaseolus vulgaris*], *Sclerotium rolfsii* on Jerusalem artichoke [*Helianthus tuberosus*] and scarlet runner beans [*P. multiflorus*], a collapse of coco-nut leaves apparently due to unsuitable water relations, and *Botryodiplodia theobromae* on yams (*Dioscorea* sp.).

BROOKS (A. J.). **Annual Report of the Department of Agriculture, Colony of the Gambia, for the year ended March 31st, 1932.**—18 pp., 1932.

Investigations into rosette disease of groundnuts in the Gambia [*R.A.M.*, xi, p. 27] have demonstrated that infection is not seed-borne (a very important point to local growers, as the crop is grown annually from seed), its percentage greatly increases during drought, it is carried over from year to year by the germination of groundnuts left in the ground after reaping, and control does not result from the eradication of self-sown groundnuts, numerous other plants (including petunia, *Vinca*, *Calliopsis*, *Calendula*, star apple trees [*Chrysophyllum cainito*], and *Lagerstroemia*) recently having been found showing typical rosette symptoms. Infection is most prevalent in July and August, and sowings in May and June developed less infection than later ones. Infection with the virus considerably increases the percentage of shell in the nuts. Conclusive evidence was obtained that close planting significantly reduces infection; where 3 by 3 ft. spacing was adopted and the plots kept free from weeds 73 per cent. of the plants were attacked, but when the same spacing was used and the weeds were permitted to grow no disease developed.

In 1922, the author obtained for seed selection purposes groundnut seed from vigorous plants growing on a native farm at Basse, the resultant crop from which formed the variety which the author named 'Basse'. It yielded 2,832 lb. per acre in 1924, and was reported upon by the Imperial Institute as being 78 per cent. kernel, 22 per cent. shell, 51·8 per cent. oil, and 0·49 free fatty acids. It remains one of the best seed varieties in the Gambia and is still markedly tolerant to virus disease. In 1924, a ton of Tennessee Red groundnut seed was imported from the Philippines, and from the progeny the author isolated two varieties, which he named Philippine Pink and Philippine White. These proved to be valuable commercial varieties, the former being the most resistant variety to virus diseases yet found. As in South and East Africa, the insect vector of virus disease in the Gambia has been identified as *Aphis laburni* Kalt. (*A. leguminosae* Theo.) [cf. ibid., ix, p. 19].

It is believed that at least two distinct types of virus attack groundnuts in the Gambia, one producing chlorosis of the leaves and the other characteristic symptoms of the rosette type without chlorosis. Plants infected with each type were grafted together, with the result that the chlorosis rosette appeared in the green rosette type, while the green rosette virus appeared in the chlorotic plants.

WALLACE (G. B.). **Report of the Mycologist.**—*Ann. Rept. Dept. Agric. Tanganyika Territory 1930*, pp. 53–55, [1932].

During the period under review lemon trees in Tanganyika Territory were attacked by a form of canker and a die-back associated with a *Physalospora*, probably *P. fusca* Stevens, on the bark, and a species of *Haplosporella* (*Sphaeropsis*), intermediate in size between *S. malorum* and *H. hesperidica* Speg., on the twigs. A root fungus, probably the C strain of *Rhizoctonia bataticola*

(*Macrophomina phaseoli*) [*R.A.M.*, ix, p. 685] was very destructive on French beans (*Phaseolus vulgaris*). Mangoes were attacked by an angular leaf spot identified as the same as that caused by *Bacillus mangiferae* in South Africa. *Sphaeropsis mori* was present on the stems and *Kuehneola* [*Cerotelium*] *fici* [ibid., x, p. 774] on the leaves of mulberries. An angular leaf spot and stem disease of oleanders was caused by *Pseudomonas savastanoi* E.F.S. var *nerii* [ibid., vii, p. 726]. *Nematospora coryli* [ibid., xi, p. 572] was found in the seeds of cowpea, pigeon pea, and *Phaseolus acutifolius*; the fungus is probably the most destructive parasite of leguminous crops in the Territory, and was found in over 28 per cent. by volume of 5,000 *P. acutifolius* beans examined.

[Walters (E. A.).] **Report on the Agricultural Department, St. Lucia, 1931.**—43 pp., 1932.

In the section of this report dealing with plant diseases (pp. 15–16) it is stated that wither-tip of limes [*Gloeosporium limetticolum*: *R.A.M.*, x, p. 160] was very rare in St. Lucia during 1931, mainly owing to the exceptionally low rainfall from January to June, but also partly as a result of improved manurial methods and better irrigation. The final crop was one-third greater than that obtained in 1930.

Conspicuous markings known locally as 'greasy spot' were observed on grapefruit leaves, having been brought about, apparently, through a check to the growth of the trees such as is caused when the roots become exposed to the sun. The application of a complete manure and the protection of the crown roots appeared to be effective in producing a healthy flush of growth.

The root disease of cacao caused by *Rosellinia pepo* [ibid., xi, p. 26] becomes prominent as the shade trees are removed. The replacement of the susceptible 'Immortelle' trees [*Erythrina* spp.] by *Gliricidia* is advised wherever possible, but gradual shade reduction by heavy pruning is much less disastrous.

Pod diseases of cacao (principally *Phytophthora faberi*) [*P. palmivora*, but also due to *Botryodiplodia theobromae*: loc. cit.] associated with wilting of suckers and of the young tips of fresh foliage and with stem canker caused serious losses after the wet months of October and November. *P. palmivora* is dependent on humid conditions, and attention to drainage, removal of excessive shade, and pruning are advised.

The sugar-cane varieties grown in St. Lucia are being replaced by others resistant to gummosis [*Bacterium vascularum*: ibid., x, p. 161] and mosaic; the former disease is now insignificant and the latter no longer present.

Jackson (T. P.). **Work connected with insect and fungus pests and their control.**—*Rept. Agric. Dept., St. Vincent, for the year 1931*, pp. 7–10, 1932.

In 1931, a cross was made between the commercial tomato variety Bonny Best which in St. Vincent is very susceptible to blossom-end rot [*R.A.M.*, x, p. 707] and an indigenous small-

fruited variety which under St. Vincent conditions has apparently remained immune; no blossom-end rot has so far been noted in the F_1 of this cross, although over 50 per cent. of the Bonny Best were attacked. Back crosses to Bonny Best will be carried out with a view to improving the fruit. Bubbly fruit rot [loc. cit.] caused significant but not serious losses in the tomato crop during the year.

In the section of this report dealing with the cotton experiment station (p. 3) it is stated that observations throughout the 1931–2 season on the rate of incidence of angular leaf spot [*Bacterium malvacearum*] in all the pedigree selections showed that all of the pure Sea Island strains now possess considerable resistance [cf. ibid., x, p. 595].

MILES (L. E.). **Plant pathology at the Mississippi Station.**—*Ann. Rept. Mississippi Agric. Exper. Stat. for 1931*, pp. 43–47, [? 1932. Abs. in *Exper. Stat. Record*, lxvi, 8, p. 745, 1932.]

Excellent control of narcissus root rot [*Fusarium* sp.: *R.A.M.*, viii, p. 42] in Mississippi resulted from soaking the bulbs for one hour in mercuric chloride (1 in 1,000) or for two to six hours in 0·25 per cent. semesan; the best results, however, were given by calogreen and calochlor.

A potash fertilizer applied to cotton on soil heavily infected with wilt [? *F. vasinfectum*] decreased the amount of infection when used in moderate amounts and well balanced with other elements. No significantly better results followed heavy potash applications in relation to the amounts of phosphorus and nitrogen, and the wilt was not further reduced by merely increasing the total quantity of fertilizer applied. Deficiency of potash appeared to increase the amount of wilt more than did deficiency of nitrate.

Tissue platings from 19 cotton plants on *Fusarium* wilt test plots showed the organism present to be a *Verticillium* (tentatively identified as *V. albo-atrum*), in spite of the fact that in each of the preceding five years the soil had been inoculated with *F. vasinfectum*.

BOURIQUET (G.). **Madagascar: list of the parasites and diseases of cultivated plants.**—*Internat. Bull. of Plant Protect.*, vi, 7, pp. 105–107, 1932.

The following are some of the parasites and diseases observed by the writer in Madagascar since October, 1929: coffee rot caused by the mycelium of an unidentified fungus (possibly *Polyporus coffeae*) [*R.A.M.*, ix, p. 32] in association with [the coccid insect] *Lachnodius greeni*, as well as by rhizomorphs resembling those of *Armillaria mellea* [loc. cit.]; oak mildew (*Microsphaera alphitoides*) [*M. quercina*]; anthracnose, brown spot, and 'leprosy' of vanilla, caused by *Calospora vanillae* [*Botryosphaeria vanillae*], *Nectria vanillae*, and *Cephaleuros henningsii*, respectively [ibid., vii, p. 806]; *Sclerotium rolfsii* and rosette on groundnuts [ibid., x, p. 639]; and an *Aecidium* on eggplant leaves and fruits [ibid., vi, p. 144]. Of these, only *Botryosphaeria vanillae* is believed to have been reported previous to the present records.

MATSUMOTO (T.) & SOMAZAWA (K.). **On the relationship between the serological reaction and other biological characters of some putrefactive phytopathogenic bacteria.**—*Journ. Soc. Trop. Agric.*, Formosa, iii, pp. 317–336, 1 pl., 1931. [Received September, 1932.]

A comprehensive account is given of the authors' further experiments at Taihoku, Formosa, on the serological reaction and other biological characters of some related phytopathogenic bacteria, viz., [*Bacillus* sp.] No. 216, a causal organism of the soft rot of pe-tsai [*Brassica pekinensis*], *Bacillus carotovorus* No. 173 (E. F. Smith's strain) and *B. aroideae* No. 174, both from the Lister Institute, London, Nos. 197 from *Zinnia* [*elegans*], 201 from radish, 204 from tomato, 212 from melon, and 403 from onion [*R.A.M.*, x, p. 87]. Nos. 197, 201, 212, and 216 were found to be morphologically similar to *B. aroideae* while 204 is slightly broader; No. 403 resembles *B. carotovorus*. The physiological behaviour of the organisms is recorded in great detail in tabular form.

It would appear from the data obtained in these tests that the organisms comprising the same serological group are also morphologically and physiologically allied. No. 197 was not very closely related to any of the other members of the same serological group. No. 174, the type strain of *B. aroideae*, is serologically distinct from any of the above-mentioned group, but in view of its morphological and cultural similarities to all the organisms under discussion except No. 403, it is considered best to class them all excepting this strain as variants of *B. aroideae*. The serological reaction forms a convenient and serviceable test for bacterial differentiation and identification, but the author considers that it should not be regarded as an infallible criterion of specific distinction.

LACEY (MARGARET S.). **Studies in bacteriosis. XIX. Researches on the group of green-fluorescent bacteria, part II; on some plant diseases caused by bacteria of the green-fluorescent group, and a comparison and discussion of various cultural characteristics of certain members of this group.**—*Ann. of Appl. Biol.*, xix, 2, pp. 190–203, 1932.

Continuing her studies of the green fluorescent group of plant pathogenic bacteria [*R.A.M.*, xi, p. 17], the author describes seven strains isolated by her, namely, one (strain 221) from potato tuber ring disease, five (strains 224, 203, 233, 248, and 238) from various types of lesions on lettuce leaves, and one (strain 234) from large brown necrotic lesions on *Medicago lupulina* seeds. The potato strain is a short, aerobic, Gram-negative, non-sporulating rod with 1 to 5 polar flagella; it does not produce indol and its diastatic action is very feeble; it liquefies gelatine and reduces nitrates with slight evolution of gas; turns milk alkaline but does not coagulate it, and reduces litmus; gives good growth in Fermi's and Uschinsky's solution, with a yellow-green fluorescence; its optimum temperature is 30° C., and there is no growth at 37°. The lettuce strain 224 differs from the former in having 1 to 4 polar flagella, in not reducing nitrates, and in not producing pigment in gelatine or agar media or in broth; the other lettuce strains were very

similar but differed slightly in biochemical properties [which are briefly indicated]. The *M. lupulina* strain has the same characteristics, with the exception that it has only one polar flagellum, does not reduce nitrates, turns milk slightly alkaline with the formation of a soft coagulum, and slowly produces a yellow-green fluorescence in liquid and gelatine media.

The cultural characters of these organisms are compared with those of 32 named species of the green fluorescent group [a list of which is given], and in discussing the cultural variations which were noticed the author fully agrees with Burkholder's statement [ibid., ix, p. 363] as to confusion arising from the tendency to create new species on slight cultural differences.

The author's strain 221 is considered to be most closely related to *Bacterium aptatum*; the lettuce strains come nearest to *Bact. marginale* but are also fairly close to *Bact. aptatum*; and the strain from *M. lupulina* is possibly a physiological form of *Bact. pisi*. It does not appear, however, that any of the characters separating these strains can be relied on absolutely.

DADE (H. A.). **Further observations on Cacao pod diseases in the Gold Coast.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 109–121, 17 graphs, 1931.

In this further progress report (pending a complete study) of investigations undertaken to obtain information on the economic aspects of cacao pod diseases as found in actual practice in native farms on the Gold Coast [*R.A.M.*, vi, p. 657; ix, p. 165] and to study the effect of neglect of cultivation on the physiology of the host, and of irregular, infrequent harvesting on pod diseases, the author presents detailed statistical evidence of production, incidence of disease, and losses in crops grown on test plots. The results obtained may very briefly be summarized as follows.

Infrequent, irregular harvesting results in high loss from pod diseases. As the season progresses the incidence of infection steadily declines. Although a much larger proportion of cacao is damaged by pod disease fungi [*Phytophthora palmivora, Colletotrichum ? cradwickii, Botryodiplodia theobromae,* and *Trachysphaera fructigena*: ibid., vi, p. 657] in the early output than in the late, inspection of exported cacao failed to reveal any clear indication of a change in quality during the season which might be correlated with this change in the disease situation. Defects in exported cacao are so largely determined by the processes of preparation and subsequent storage that the effect of disease is masked.

In determining the fluctuating annual behaviour of cacao, local environment is at least as important as are meteorological conditions, though the distribution of rainfall and the dry harmattan wind season [December and January] are of the first importance in determining periodicity and magnitude of the crop and, indirectly, the effect of disease.

With regard to the view previously expressed that the site of infections of cacao pods [by *P. palmivora*: loc. cit.] was determined by the morphological characters of the tree and pods, it is stated that evidence since obtained shows that whereas the

proportion of distal infections does not vary appreciably whatever the amount of infection, the greater the incidence of disease the greater the proportion of lateral infections and the less the proportion of proximal infections. The interaction of constant morphological and fluctuating microclimatic factors is probably responsible for the annual variation in the site-distribution of pod infections.

Pod disease arising from cushion canker (*P. palmivora*) results from the previous year's pod infections, but the actual amount of pods that become infected from this source depends on some conditions of the current season. Pod infections from the cushion are not influenced directly by the external conditions which determine infections from other sources, but are determined solely by internal factors. Of these the physiological condition of the tree is probably the most important, the activity of the fungus in the bark being inhibited by the comparatively good condition of the tree in more favourable seasons. In 1928 and 1930 there was relatively little disease from this source, though it was severe in 1929, the former being favourable years for the tree and the latter an unfavourable one.

Systematic records have confirmed the view that cushions infected in one year transmit the disease to the crop of the following year; in the second year the cushions are destroyed by the fungus. The effect of cushion canker on the crop is progressive and very serious; in three successive years the destruction of cushions accounted for losses of 7·5, 8·6, and 5·4 per cent., respectively, of the crop. The crop borne on the remainder of the tree is also affected, as new foci of infection are produced each year from the cankers. This in itself justifies the prompt removal of diseased pods in order to prevent the passage of the disease back to the cushion.

DADE (H. A.). **The determination of incidence of black pod disease of Cacao.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 122–128, 9 graphs, 1931.

Further investigations, based on more exact methods and meteorological apparatus, into black pod disease of cacao (*Phytophthora palmivora*) [*R.A.M.*, viii, p. 26 and preceding abstract] on the Gold Coast (the observations being necessarily confined to the trunk crop, up to about 7 ft. from the ground) showed that the incidence of the disease and hence of the loss of crop is determined by the length of time during which the atmosphere is saturated with water (and the pods are covered with a film of water) and by the proportion of actively infectious diseased pods present on the farm. Other factors such as contact with diseased pods, morphological characters favouring the retention of drops of water in contact with the pods, and pre-existing cushion cankers are constant and subsidiary, being active (except cankers) only as a result of one or both of the two main determining factors; infections due to canker depend neither upon external humidity nor upon external sources of infection, but result from the external conditions of the previous season, and are ultimately subject to the same control as other infections. Both spread of infection and canker can

be controlled by the prompt removal of pods in the early stages of disease.

Owing to the favourable climatic conditions prevailing in the tropical rain forest the disease on the Gold Coast is continuously active throughout the year, though its activity fluctuates with the determining factors. To be effective spraying would have to be so frequent as to be economically impracticable. The best protection against black pod consists in sound methods of cultivation and sanitation.

WRIGHT (J.). **A note on the saprophytic existence in nature of Phytophthora palmivora, (Butler), the causal organism of 'black pod' disease of Cacao.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 251–254, 1931.

An experiment [which is described and the results of which are tabulated] showed that during the dry season in the Gold Coast the causal organism of cacao black pod disease, *Phytophthora palmivora*, when present in the soil, is slowly exterminated by soil saprophytes [cf. *R.A.M.*, i, p. 399]. The fungus was shown to persist in the soil for at least four months. When diseased cacao husks were placed in soil *P. palmivora* was recovered in a strongly virulent form after six months [cf. ibid., vi, p. 658]. The slight risk of infection from husk heaps (carried by tools, insects, animals, wind, etc.), might perhaps be reduced by burying the husks.

STAHEL (G.). **Contribution to the knowledge of witchbroom disease.**—*Trop. Agriculture*, ix, 6, pp. 167–176, 1932.

This is a translation from the Dutch by B. G. Montserin, of the Department of Agriculture, Trinidad, of Stahel's paper, published in 1919 [*Dept. v.d. Landbouw, Surinam, Bull.* 39] on the witches' broom disease (*Marasmius perniciosus*) of cacao.

DADE (H. A.). **A note on the sun-drying of Cacao.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 107–108, 1931.

Under Gold Coast conditions, the sun-drying of cacao during the cropping season is delayed by frequent rains and limited sunshine. In the rain forest zone, where the cacao areas lie, the sky remains overcast for a large part of most days; in one typical instance, for example, cacao required 13 or 14 days to dry, after which it showed over 25 per cent. of mouldy beans [*R.A.M.*, ix, p. 163; xi, p. 30]. The difficulties attendant on sun-drying are largely responsible for the mouldy component characteristic of Gold Coast cacao.

GASSNER (G.). **Über Verschiebung der Rostresistenz während der Entwicklung der Getreidepflanzen.** [On the modification of rust resistance during the development of cereal plants.]—*Phytopath. Zeitschr.*, iv, 6, pp. 549–596, 1932.

A comprehensive and fully tabulated account is given of the writer's investigations, conducted at Estanzuela, Uruguay, in 1927, on the modifications in reaction to rust resistance undergone by cereals in the process of development. The rusts studied were

Puccinia triticina and *P. graminis* on wheat and *P. coronifera* [*P. lolii*] on oats [*R.A.M.*, xi, pp. 358, 630]. All the three rusts were found persisting in the uredo stage during the winter of 1927, and the tests were carried out on plots sown at frequent intervals during the (Uruguayan) autumn, winter, and spring months, March to October.

On the basis of their varying effects on the plants at different stages of growth, the rusts could be divided into two main groups, one represented by *P. triticina* and the other by *P. graminis* and *P. lolii*, the former causing the most severe symptoms on young plants, diminishing as the plant grew older, and the latter on older plants, the younger ones being more resistant. Within the same variety of host plant the degree of infection varied to some extent according to the age of the plant. Thus, in the highly resistant Perez Castellano wheat there was a loss in resistance as the plants grew older, though in this case no difference could be detected in the reaction of leaves inserted at nodes of different heights. In most other varieties leaves of different ages differed in their reaction to infection, and in general it may be said that in each leaf there is a tendency to variation in the reaction to rust during the period between its first development and its full maturity or withering; the extent to which this is manifested differs according to the position of the leaf insertion on the stem. It is pointed out that these discrepancies should be considered in estimating the relative resistance and susceptibility of different wheat and oat varieties to the rusts in question.

GASSNER (G.) & GOEZE (G.). **Über den Einfluss der Kaliernährung auf die Assimilationsgrösse von Weizenblättern.** [On the influence of potash nutrition on the assimilatory capacity of Wheat leaves.]—*Ber. Deutsch. Bot. Gesellsch.*, 1*a* (*Festschr.*), pp. 412–482, 13 figs., 3 diags., 7 graphs, 1932.

In connexion with an exhaustive investigation in Germany on the influence of potash nutrition on the assimilatory capacity of wheat leaves, attention is drawn to the fact, already observed by the first-named writer and Hassebrauk, that plants liberally supplied with potash acquire a high degree of resistance to rusts [*Puccinia graminis*, *P. glumarum*, and *P. triticina*], while marked susceptibility characterizes those deprived of this substance [*R.A.M.*, xi, p. 98]. In the present studies a high assimilatory capacity of the leaves (a prerequisite condition for rust infection) was found to be constantly correlated with lack of potash, so that it is reasonable to connect the presence of this mineral, resulting in a low power of assimilation, with resistance to rust.

ALLEN (RUTH F.). **A cytological study of heterothallism in Puccinia triticina.**—*Journ. Agric. Res.*, xliv, 10, pp. 733–754, 11 pl., 1932.

This is the detailed and fully illustrated account of the author's investigation of the heterothallism of *Puccinia triticina*, a comprehensive abstract from which has already been noticed [*R.A.M.*, xi, p. 231].

Smith (W. K.). **The effect of different temperatures on the reaction of Hope Wheat to bunt.**—*Phytopath.*, xxii, 7, pp. 615–627, 1 graph, 1932.

In a series of experiments [details of which are given] at Pullman, Washington, the Hope wheat variety has shown a high degree of resistance to three physiologic forms of *Tilletia tritici* [*T. caries*] and two of *T. levis* [*T. foetens*] when planted at the usual date for spring sowing [*R.A.M.*, ix, p. 368], but was moderately susceptible to all five forms in the autumn sowings.

Sowings of Hope and Jenkin, a susceptible variety of *Triticum compactum*, were made in the field in the late autumn of 1929, the seeds being inoculated with a physiologic form of *T. caries* (T2) and sown at weekly intervals from 29th October to 26th November. The percentage of bunt decreased in both varieties in each weekly sowing (from 45·7 and 95·3 in Hope and Jenkin, respectively, on the first date to 4 and 8, respectively, on the last). In the sowings made early in the spring of 1930 (14th March) Hope was resistant (though less so than when sown at the normal dates at the end of March or early April) and Jenkin susceptible (7 and 68 per cent. infection, respectively).

The relation between temperature and reaction to bunt at different stages of growth was determined for Hope and Jenkin with seeds inoculated with T2 and sown in the greenhouse in the winter of 1929–30. Hope proved resistant (1 per cent. infection) when grown at a relatively low temperature (9° C.) until emergence from the soil and then at a higher one (21°), while plants grown continuously in the cool environment were quite susceptible (45 per cent. bunt). Jenkin was susceptible under both high and low temperature conditions.

The different reactions exhibited by Hope in autumn and spring plantings seem to be due mainly to the temperatures prevailing after the emergence of the seedlings. The relative growth rates of Hope and Jenkin at this stage showed that the resistance of the former at the higher temperature is not attributable to more rapid development. Possibly the property in question may be dependent either on adverse nutritional conditions or on an organization of the protoplasm that retards or inhibits the growth of the fungus in a warm environment.

Flor (H. H.). **The production of bunt chlamydospores in the vegetative tissue of the Wheat plant.**—*Phytopath.*, xxii, 7, pp. 661–664, 2 figs., 1932.

During the winter 1930–1 the writer inoculated seedlings of Prelude wheat with paired monosporidial cultures of each of the two bunt fungi, *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*]. The plants were grown in a greenhouse at Arlington Farm, Virginia, at 20° C. and subjected to lengthy periods of artificial illumination. When the heads were approaching maturity the soil was thoroughly soaked to stimulate the production of secondary shoots by plants that had remained free from infection in the first place. A number of the new shoots sent out from the basal nodes were stunted and the leaves bore wart-like galls filled with the chlamydospores of the organisms, those of *T. caries* having reticulately marked walls,

while those of *T. levis* and the interspecific cross were smooth. The galls in the leaves occurred in irregular, non-continuous strands a few mm. to 1 or 2 cm. in length, extending from the leaf blade into the undifferentiated leaf and stem tissue at the node. The galls in the stems were inconspicuous and might have escaped notice but for the twisting and distortion of the affected parts.

LESZCZENKO (P.). **Doświadczenia z nowemi środkami do zaprawiania nasion zbóż przeciw grzybkom głowniowym.** [Tests of new materials for the disinfection of cereal seed-grains against smut fungi.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Sec. State Inst. Agric. Sci. in Bydgoszcz*], 11, pp. 77–86, 1 pl., 1932. [French summary.]

The results [presented in tabular form] of experiments from 1929 to 1931 showed that two new Polish proprietary fungicidal dusts, namely, cyranik of the Chemical Works Azot in Jaworzno and ziarnik, at the rate of 0·2 to 0·4 per cent. by weight of the seed-grain, were as effective in the control of wheat bunt (*Tilletia tritici*) [*T. caries*] and of stripe [flag] smut of rye (*Urocystis occulta*) as steeping the grain in 0·1 per cent. formaldehyde for 30 minutes. Besides their marked fungicidal action, the two dusts also increased the dry weight and the height of plants raised from seed-grain treated with either of them.

TORNOW (ELISABETH). **Einwirkung und Nachweis des Quecksilbers bei der Beizung des Saatguts.** [Action and detection of mercury in the disinfection of seed-grain.]—*Phytopath. Zeitschr.*, iv, 6, pp. 631–637, 1932.

By means of the electrolytic apparatus previously described [*R.A.M.*, xi, p. 361], the writer found that traces of mercury adhered to rye seed-grain dusted ten weeks earlier with ceresan and other organic mercury compounds, as well as to that steeped in germisan (0·125 per cent.) and uspulun-universal (0·2 per cent.). It was found to be impossible to remove the mercury by washing the seed-grain, the use of which for fodder should therefore be avoided.

FLOR (H. H.). **The effect of delayed planting on the control of bunt by copper carbonate dust.**—*Phytopath.*, xxii, 7, pp. 651–655, 1932.

To determine the comparative efficacy of the formaldehyde soak and copper carbonate dust treatments against wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], periodic sowing tests [the results of which are discussed and tabulated] were carried out at Pullman, Washington, during 1930–1. The efficacy of the formaldehyde treatment was found to be fairly consistent, ranging from 88·5 per cent. in the fourth sowing on 29th September to 100 per cent. in the tenth on 10th November, whereas that of copper carbonate decreased with each successive sowing from 94·5 per cent. in the first to 64·8 per cent. in the tenth. Up to and including the fifth sowing, the differences between the treatments were

not significant, but in the later sowing the dust was markedly inferior. Possibly these results may help to explain the numerous failures reported in the commercial use of the copper carbonate dust treatment [cf. *R.A.M.*, x, p. 229].

FRIEDRICHS (G.). **Ein Jahr Überwachung der Lohnsaatbeizstellen in Westfalen.** [A year's supervision of the co-operative seed-grain disinfection plants in Westphalia.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 7, pp. 53–54, 1932.

Of the 140 co-operative cereal seed-grain disinfection plants [cf. *R.A.M.*, xi, p. 36] inspected in Westphalia during 1931, 102 satisfied the necessary requirements, 18 were defective, and 20 useless. Official recognition was eventually granted in 111 cases, i.e., 79·3 per cent. of those submitted for testing and 58·7 per cent. of the total number in the province. Of 228 samples of treated seed-grain examined, 135 or 59·2 per cent. were adequately disinfected. These figures represent an improvement over preceding years, when up to 80 per cent. of the seed-grain was insufficiently disinfected.

SUPPER (R.). **Über die Wirkung von Trockenbeizen.** [On the action of dusts.]—*Zeitschr. für Pflanzenkrankh u. Pflanzenschutz*, xlii, 7–8, pp. 319–350, 1932.

A comprehensive and fully tabulated account is given of the writer's investigations at Hohenheim and other places in Germany, on the influence of the soil type and reaction and the water relations of the seed-bed on the action of certain fungicidal dusts on snow mould of rye (*Fusarium*) [*Calonectria graminicola*], stripe disease of barley (*Helminthosporium*) [*gramineum*], and bunt of wheat [*Tilletia caries* and *T. foetens*]. The experiments on rye were conducted in the greenhouse and those on barley and wheat in the open.

The type of soil (loam, sand, or clay) and the water content of the seed-bed (heavy irrigation immediately after sowing) produced virtually no influence on the action on *C. graminicola* of ceresan, abavit B, and tutan (1·5 and 2 gm. per kg. of seed-grain). Only in soil with a strongly acid reaction (P_H 4·40 or 5·40) was there a certain increase in the efficacy of the dusts, which was least noticeable with ceresan. None of the above-mentioned factors influenced the toxicity of the dusts towards the agents of wheat bunt and barley stripe to any appreciable extent.

In order to determine the length of time required by the dusts to inhibit the development of *C. graminicola* and *H. gramineum*, an attempt was made to stop the fungicidal action (initiated by placing the treated seed-grain in damp sand) by removing or counteracting the fungicide after a given period. This was effected by removing the treated grain by sifting and then washing it with weak acids and lyes, after which it was placed for 20 hours in damp soil, which greatly assisted in removing the fungicide. In the rye experiments it was found that a great proportion (up to 75 per cent.) of the fungicidal effect was neutralized by this treatment, after periods in damp sand of from 5 minutes to 24 hours, in the

case of abavit B; up to 55 per cent. with ceresan; and up to about 80 per cent. with tutan. Similar results were obtained with stripe-diseased barley, the toxicity of all three dusts being largely neutralized by periods up to 34 hours in damp soil.

The germinative capacity of the seed-grain treated with abavit B and tutan was increased by 48 hours' storage previous to sowing [*R.A.M.*, xi, p. 567], while ceresan was not affected.

ROBERTSON (H. T.). **Maturation of foot and root tissue in Wheat plants in relation to penetration by Ophiobolus graminis Sacc.**—*Scient. Agric.*, xii, 10, pp. 575–592, 5 pl., 1 fig., 1932.

The work described in this paper was undertaken for the purpose of determining whether the decreasing susceptibility of the wheat plant, as it grows older, to infection with the take-all fungus (*Ophiobolus graminis*) reported by Broadfoot [*R.A.M.*, xi, p. 291] is correlated with morphological and chemical changes in the maturing base of the host plant, the material used being in part the same as employed by this writer. The part of the plant examined (the 'foot') consisted of the seminal roots developed from the vascular plate of the scutellar node, the subcoronal internode, and the crown roots developing from several crowded nodes which form the 'crown' at the top of the latter. The results showed that the marked falling off of infection in plants over 40 days old is coincident, under greenhouse conditions, with a pronounced increase in the amount of lignified tissue in the foot of Marquis wheat, chiefly occurring in the xylem, pericycle, the fibres of the vascular bundle sheaths, and in the subepidermal layers of the cortex of the crown roots; the cells of the last-named organs become much thickened with advancing age. It is believed that these and other chemical changes at times may prevent further progress of the root-rotting fungi.

The investigation also demonstrated that infection and penetration of the host tissues by *O. graminis* in plants after the seedling stage are essentially the same as described by Fellows for the seedling stage [ibid., viii, p. 369], all the evidence pointing to the fact that extensive penetration of the tissues usually occurs before marked lignification has taken place. The crown appears to be invariably penetrated from the sub-coronal internode and the crown roots, especially the latter.

The appearance of the roots of plants inoculated with a mixture of *O. graminis*, *Helminthosporium sativum*, and *Fusarium* sp. was much the same as that of those inoculated with *O. graminis* alone, the only distinctive morphological character being the usual association with *O. graminis* infection of 'lignitubers' [ibid., viii, p. 370; x, p. 812], while discoloration of the wheat foot is not a reliable criterion, as it may also be associated with drought injury.

GEACH (W. L.). **Foot and root rots of Wheat in Australia.**—*Journ. Australia Council Sci. & Indus. Res.*, v, 2, pp. 123–128, 1932.

From foot-rotted wheat [see preceding abstract] obtained from

numerous areas in Australia the author obtained a large number of cultures of *Fusarium* spp., many of which belonged to the *discolor* group, producing, on potato dextrose agar, bordeaux, rose, honey-coloured, and white hyphae, accompanied by the production of bordeaux pigment in the agar. Of these, a large number were macroscopically similar and were identified as *F. culmorum*, the conidial measurements of two isolations that were selected for comparative study closely agreeing with those of a strain from Saskatchewan: these were determined by Wollenweber as *F. culmorum*. Eighteen wheat varieties when inoculated in the glasshouse and the field with transfers from these two isolations all developed typical foot-rot symptoms. In the field tests, some of the plants showed also the whiteheads usually attributed to *Ophiobolus graminis*.

PRISSYAJNYUK (A. A.). К вопросу об изучении фузариова хлебных злаков. [Contributions to the study of *Fusarium* diseases of cereal crops.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 173–200, 1932. [English summary.]

The major part of this paper is a condensed review of the recent work done by various investigators in the study of the genus *Fusarium* [most of which has been noticed from time to time in this *Review*]. Considerable details are given of the methods for the culturing and identification of the different sections and species of the genus, synoptic tables and keys of which are given in appendices. This is followed by a brief account of the author's investigation of the species of *Fusarium* that occur in the soil and on a number of cultivated plants, with particular reference to cereal crops, in the Lower Volga basin. Among the species associated with winter injury and other diseases of wheat in the region the following four were isolated and definitely identified, namely, *F. arcuosporum*, *F. arthrosporioides*, *F. solani* f. *minus*, and *F. dimerum*, and their technical descriptions in Russian are given in a separate appendix.

CORMIER (P.). **Le Septoria graminum, champignon parasite du Blé.** [*Septoria graminum*, a parasitic fungus on Wheat.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 20, pp. 671–672, 1932.

For the last few years the winter wheat crops in the Vendée and Loire-Inférieure have been severely damaged by *Septoria graminum* [*R.A.M.*, ix, p. 225], the losses from which for the 1931–2 season are estimated at more than a tenth of the harvest. The fungus appears towards the end of December or early in January, producing small, yellow spots which later expand, causing partial desiccation of the collar and stunting of the roots. The disease is more severe on crops following potatoes than on those preceded by clover or fallow. The most susceptible varieties are Japhet and Vilmorin 23 and 27, while Alliés and D. C. Tourneur are relatively resistant. As soon as the disease is observed, nitrogen should be applied in a readily assimilable form in order to increase the resistance of the plants.

OWEN (W. L.). **Ultra-violet rays prevent molding of bread.**—*Food Industries*, iv, 6, pp. 208–210, 3 figs., 1932.

Excellent control of moulds in bread was obtained by the Wm. Wolfe Baking Co., Baton Rouge, Louisiana, by the exposure of loaves to ultra-violet rays (wave lengths of 2,700 to 3,000 Ångström units in one test and of 2,100 to 2,300 in another). *Penicillium* spp. were found to be more resistant to this method of treatment than *Aspergillus* spp. By the application of a continuous fungicidal light to the bread during slicing it was found possible to sterilize the slicer (a prolific source of mould contamination) and inactivate the fungi at the same time.

NAHMMACHER (J.). **Beitrag zur Immunitätszüchtung der Gerste gegen Ustilago nuda forma spec. hordei.** [Contribution to breeding Barley for immunity from *Ustilago nuda* forma spec. *hordei*.]—*Phytopath. Zeitschr.*, iv, 6, pp. 597–630, 1932.

In the course of four years' experiments [the results of which are fully discussed and tabulated] at Halle University the writer inoculated by Seiffert's method 728,450 barley flowers with *Ustilago nuda* forma spec. *hordei* [*R.A.M.*, vi, p. 412]. The apparatus used for the infections was the same as that figured in Grevel's paper on the biological forms of *U. tritici* [ibid., ix, p. 708] and blows the dry spore dust into the flowers by means of an insufflator. Reaction tests on 243 varieties revealed a high degree of resistance in most of the foreign naked (hull-less) sorts of the inaequale type, while the summer varieties of the nutans C group were the most susceptible. Inaequale winter barleys were mostly very susceptible, while some of the two-rowed winter varieties were moderately resistant.

No resistant lines were yielded by selection from crosses between moderately susceptible × highly susceptible and highly susceptible × highly susceptible strains (139 in all), resistant or immune parent varieties evidently being requisite for the production of resistant progeny. The results of eight crosses between resistant and susceptible varieties failed to provide an exact analysis of the factors governing the reaction of the F_3 progeny, but there was some indication of a monomerous tendency to resistance in the resistant varieties. No highly susceptible progeny resulted from a cross between a resistant and a moderately susceptible variety.

On the basis of inoculation experiments with 45 loose smut collections two biologic strains of the fungus were differentiated by their varying behaviour on standard German barley varieties, viz., one from original winter barley producing only 15 and 5·2 per cent. infection, respectively, in two years' tests on Mittlauer Hanna, and one from original summer barley for which the corresponding figures on the same variety were 71·7 and 83 per cent., respectively. Similar results were obtained with the differential varieties, Heil's Franken and Mahndorfer Hanna.

MACKIE (W. W.). **A hitherto unreported disease of Maize and Beans.**—*Phytopath.*, xxii, 7, pp. 637–644, 4 figs., 1932.

This is an expanded account of the writer's investigations on the

'charcoal rot' (*Rhizoctonia bataticola*) on maize and beans (*Phaseolus vulgaris*, *P. lunatus* [var.] *sieva*, and *P. multiflorus*) in California, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 171]. Blackeye cowpeas (*Vigna sinensis*) have also been found infected by the fungus, the pycnidial stage of which (*Macrophomina phaseoli*) has not yet been observed. Large Lima beans, *P. lunatus*, have hitherto escaped infection.

On maize and beans the disease is not visible until the plants approach maturity, and it may cause severe lodging of the maize from the bending or breaking of the stalks near ground level. Apparently the xylem is first attacked but the fungus then spreads to the cambium, phloem, and pith.

SĂVULESCU (T.) & RAYSS (T.). **Influence des conditions extérieures sur le développement de Nigrospora oryzae (B. et Br.) Petch, parasite du Maïs en Roumanie.** [The influence of external conditions on the development of *Nigrospora oryzae* (B. et Br.) Petch, a Maize parasite in Rumania.]—*Comptes rendus Acad. Sci.*, cxciv, 15, pp. 1262–1265, 1932.

The following data were obtained by the writers from their studies on the influence of the hydrogen-ion concentration of the medium and of temperature on the development of *Nigrospora oryzae*, the agent of severe injury to maize rachids in Rumania [*R.A.M.*, x, p. 725]. The viability of the spores is lost after two years, or after one if exposed to air. The minimum, optimum, and maximum temperatures for germination were found to be slightly below 10°, 30°, and 47° C., respectively; the best mycelial growth also occurred at 30°. Damp heat (49·5°) kills the spores in four days; at 51° they succumbed in six hours, at 53° in one hour, at 58° in six minutes, and at 67° in four minutes. The spores are destroyed by 16 hours' exposure to dry heat at 67°.

Spore germination was most profuse, both in a medium of maize meal and in Wollenweber's synthetic medium, when the hydrogen-ion concentration was adjusted to P_H 4·4 to 4·8 by the addition of citric acid, tartaric acid being less effective. Potassium oxide was found to stimulate sporulation, even at an alkaline reaction, to a much greater extent than sodium oxide. At the limits of acidity and alkalinity (P_H 3·5 and 8·4, respectively), as well as at high temperatures (49·5° to 67°), the fungus forms intercalary encystments and abnormal spores.

STOREY (H. H.). **A bark disease of Coffee in East Africa.**—*Ann. of Appl. Biol.*, xix, 2, pp. 173–184, 2 pl., 1 fig., 1932.

An account is given of a bark disease of Arabica coffee which is stated to occur in the Usambara Mountains of Tanganyika Territory; so far, however, serious economic loss is known to have been caused by it in only one plantation, the coffee bushes (some 30 years old) in which were 'stumped' [cut back] in 1927, following which they were heavily attacked by the disease and many were killed by 1930. In green stems the young lesions appear as slightly shrunken areas with a water soaked margin, varying in colour from cinnamon to tawny olive. Later, the lesions darken in colour (with sometimes lighter tones in the centre) and have an

orange halo gradually merging into the normal green of the surrounding healthy tissues. In advanced stages there is a characteristic constriction in the stem; externally the margin of the lesion is usually not sharply delimited, but occasionally it may be bordered by a swollen ridge, in which case the bark tends to shred off and leave the wood exposed. The lesions are usually within a few inches of the base of the shoots, after the death of which they may spread down into the tissues of the stump. The disease usually results in the ringing of the attacked stems, but many months may elapse before the shoots wilt and die, the wilting, when it occurs, being sudden and the leaves remaining attached to the dead shoot for a considerable time. Histologically, all the external tissues of the stems, down to and including the cambium, are killed. No clear evidence was seen of any reaction in the host tissues in advance of the progress of the lesions. On the leaves the fungus causes brown, zonate, circular or irregular spots up to 14 mm. in diameter.

Isolations from the lesions yielded three species of fungi, namely, *Fusarium lateritium* var. *longum*, *F. eumartii*, and *Gloeosporium coffeicola* (which the author considers to be identical with *Colletotrichum coffeanum* [*R.A.M.*, xi, p. 368]). Of these, the first-named alone was shown by inoculation experiments to be pathogenic to Arabica coffee. These tests and field observations indicated that a common mode of entry of the fungus into the stem tissues was through freshly exposed leaf scars, and occasionally by passage from a leaf spot down the petiole. In the field many cases were also seen in which the fungus passed into the shoots through the tissues of a stump from the base of a dead twig. Of the species of *Coffea* tested, *C. arabica* alone exhibited susceptibility to the disease. In giving a brief morphological and cultural description of *F. lateritium* var. *longum*, it is stated that perithecia were not obtained in pure cultures, though the fungus is reputed to be the conidial stage of *Gibberella baccata* [ibid., vi, p. 101].

Although excision of the affected bark of a stump was effective in checking the advance of the fungus, it is considered that this operation is not practicable under plantation conditions.

STOUGHTON (R. H.). **The morphology and cytology of Bacterium malvacearum E.F.S. Part II. Reproduction and cell fusion.** *Proc. Roy. Soc. London*, Ser. B., cxi, B 769, pp. 46–52, 2 pl., 1932.

In continuation of his study of the morphological and cytological details of his strain of *Bacterium malvacearum* [*R.A.M.*, ix, p. 376], the author states that he was able to observe the production of the coccus-like bodies that are budded off from the bacterial rods as mentioned in his previous communication; after the bud forms there appears to be a 'pinching in two' of the 'chromatin' material in the parent rod, after which the coccus, containing a single nucleus-like body, becomes detached from the rod, and after an interval, as yet undetermined, germinates by means of a papilla which appears at one point and grows out into a new rod, apparently identical with the normal vegetative cell. The whole process is reminiscent of the vegetative spore cycle of the lower

fungi. Besides these bodies, others were also seen, apparently arising from the point of fusion of two rods standing at an angle to each other, and liberated by what seemed to be the degeneration of the parent cells. The subsequent history of these spherical bodies ('zygospores'), easily distinguishable by their strong staining properties, has not yet been determined with certainty.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Seed transmission of Cotton wilt.**—*Science*, N.S., lxxvi, 1959, pp. 61–62, 1932.

In 1930 cotton seed of the Half and Half variety collected during the previous autumn in Texas, and known to be infected by wilt (*Fusarium vasinfectum*) [*R.A.M.*, xi, p. 638], was divided into two lots. The seed of one lot was planted in a series of forty cylinders sunk in the ground, tightly sealed at the bottoms and filled with sifted Norfolk fine sandy loam soil that had not been under cultivation for at least fifty years. Untreated seed from the infected plants was sown in wilt-free soil in 20 cylinders, while seed delinted with sulphuric acid and surface-sterilized with 1 in 1,000 mercuric chloride was sown in the other 20. Plants in two of the cylinders of each lot developed typical *Fusarium* wilt, which attacked 3·3 per cent. of the total of 667 plants. On the other hand, not a single plant became wilted among the 723 raised from seed of normal Gorham Lonestar plants sown in the same soil in forty adjoining cylinders. In the second experiment with delinted and untreated seed, respectively, in two boxes, typical wilt developed in both, 2·2 per cent. of 644 plants contracting the disease, while no case of wilt occurred in a third box planted with seed from normal plants.

F. vasinfectum was recovered from all the wilted plants and successfully reinoculated into cotton seedlings. In 1929 and 1930 the fungus was isolated from only a small percentage of the seeds (2·2 and 4·6, respectively), but in 1931 the proportion of internally infected seeds was higher (23·7), the average for the three years being 5·9. In 1930 *F. vasinfectum* was recovered from the tap-roots, main stems, peduncles, and some seeds from every boll of 9 of the 45 plants from which cultures were made. With the other 36 plants the fungus was obtained from the tap-roots, main stems, and peduncles, but not from the seeds. In 1931 the fungus was isolated from some of the seeds from all the bolls of two out of eight plants.

KELLERMAN (K. F.). **Ozonium root-rot—a problem of the eradication of a soil-infecting fungus.**—*Journ. Econ. Entom.*, xxv, 3, pp. 433–434, 1932.

The author states that an outbreak of *Ozonium* [*Phymatotrichum omnivorum*: *R.A.M.*, xi, p. 640], the cotton root rot fungus, discovered a few years ago on the grounds of the date palm [*Phoenix dactylifera*] experiment station at Indio, California (stated to be the most western point in which the disease has been hitherto recorded), was successfully suppressed by injecting the soil, at a depth of 6 feet, with a 1·25 per cent. solution of formalin at the rate of approximately 1 gallon of solution per cu. ft. of soil. The apparatus used for the application is briefly described.

NIÑO (F. L.). **Onixis y perionixis de origen blastomicosico (estudio clinico y micologico.)** [Onychia and paronychia of blastomycotic origin (a clinical and mycological study).]—5a *Reunion Soc. Argentina Patol. Region. Norte, Jujuy, 1929*, pp. 270–281, 1930. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 391, 1932.]

A yeast-like fungus, to which the name of *Monilia periungualis* n. sp. is given, was isolated from the pus of lesions in the periungueal groove in a case of onychomycosis with paronychia. The creamy colonies contain blastospores and hyphae. The organism was pathogenic to laboratory animals.

HALER (D. H.). **Monilia pinoyi: some further studies in connection with its cultures and chemical reactions.**—*Brit. Journ. of Dermatol.*, xliv, 8–9, pp. 435–444, 1932.

Continuing his studies on *Monilia* [*Candida*] *pinoyi* [*R.A.M.*, x, p. 790], the writer again found that the medium of choice for this organism is 1 per cent. glucose agar, closely followed by 1 per cent. mannitol agar. Maltose, galactose, glucose, mannite, and dextrin were fermented with acid production (and gas in the case of the first-named). All the 17 strains at present maintained in culture have remained absolutely constant in regard to their sugar reactions. One strain was found to resist desiccation for three and another for four weeks. The growth of the organism was inhibited by brilliant cresyl blue at concentrations of 1 in 50,000 and upwards in broth dilutions without sugar, as well as by 0·02 per cent. $CuSO_4$ or $Cu(NO_3)_2$. Monsol also completely inhibited the growth of *C. pinoyi* at a dilution of 1 in 500, while at 1 in 200 it killed the fungus.

From a small series of animal experiments the writer claims to have satisfied Koch's postulates with regard to the causation of paronychia by *C. pinoyi*, the fungus having been isolated from human cases, inoculated into animals with positive results, and recovered from the lesions thus induced. The human cases under investigation comprised eight of paronychia, one each of onychia and vaginitis, three of buccal infection, and two of dermatitis accompanied by mild paronychia. The most striking feature of the animal experiments was the rapid death consequent on intravenous injection of living cultures of *C. pinoyi*, and the complete absence of symptoms when killed cultures were used.

HALER (D. H.). **Bronchomoniliasis.**—*Brit. Med. Journ., 1932*, 3726, pp. 1052–1053, 1932.

Referring to G. Oliver's observations concerning the prevalence of bronchomoniliasis in Jersey [*R.A.M.*, xi, p. 645], the writer states that, in his extensive experience as pathologist to the London Infants' Hospital, he has been unable to isolate a true *Monilia* [*Candida*] from sputum, though the organisms are relatively frequent in children's mouths, even in the absence of clinical signs of infection. Some twenty strains of the fungus are now in culture, derived from 70 cases of paronychial moniliasis and buccal infection (mostly the former), in none of which the pulmonary system was involved. It would appear from these data and the

author's other published work (*Brit. Journ. of Dermatology*, xliii, p. 343, 1931) that *Candida* is of etiological importance only as an agent of epithelial infections of the skin and mucous membranes.

MARETT (P. J.). **Bronchomoniliasis.**—*Brit. Med. Journ., 1932*, 3729, p. 1190, 1932.

The writer does not accept D. H. Haler's claim that *Monilia* [*Candida*] is of no importance as an agent of pulmonary infection [see preceding abstract]. In 1931 the sputa of 579 individuals were examined at St. Helier, Jersey; of this number 90 showed mixed infection of tubercle bacilli and blastomycetes, 326 were positive for the latter, chiefly represented by *Monilia* [*Candida*], while 163 were negative for both types of infection. During the period of eleven years covered by these routine bacteriological examinations, the annual number of deaths from pulmonary tuberculosis has fallen from 69 to 34.

HALER (D. H.). **Bronchomoniliasis.**—*Brit. Med. Journ., 1932*, 3732, p. 122, 1932.

Replying to P. J. Marett's criticisms of his experimental work on bronchomoniliasis [see preceding abstract], the writer deals *seriatim* with the various objections raised. As regards the supposed role of the blastomycetes in the causation of the disease in Jersey, as evidenced by their constant presence in the sputum, it is pointed out that no proof is forthcoming in support of this statement. Such *Monilia* [*Candida*] spp. as may be found in the course of post-mortem examination may be merely secondary invaders or even accidental air-borne contaminants. The occurrence of these organisms in the sputum does not necessarily imply that they are causal, any more than the yeasts which are of such frequent occurrence in carcinoma ventriculi. The fact that the mortality from pulmonary tuberculosis in Jersey has fallen by 44 per cent. in ten years can scarcely be ascribed solely to the improved diagnosis of bronchomoniliasis, especially as the corresponding figure for England and Wales is about 12 per cent. during the same time.

DESSY (G.). **La chémiothérapie des mycoses. I. Partie: Aspergillose. II. Note. Expériences 'in vivo'.** [The chemicotherapy of mycoses. First part: Aspergillosis. Second note. Experiments '*in vivo*'.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 4, pp. 113–118, 1932.

Experiments on a rabbit artificially inoculated with *Aspergillus fumigatus* showed that crystal violet, brilliant green [*R.A.M.*, ix, p. 327 *et passim*], chloride of copper, and to a less degree dahlia, are endowed with a good degree of chemicotherapic power, especially when these substances are inoculated into the subject contemporaneously with the infective material.

DESSY (G.). **La chémiotherapie des mycoses. IIème Partie: Penicillose.** [The chemicotherapy of mycoses. Second part: Penicilliosis.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 4, pp. 119–126, 1932.

In studies of the power of inhibition on the development of

cultures and of the fungicidal power *in vitro* (both on the spores and mycelium) of 51 colouring agents and 24 metallic salts [cf. preceding abstract] carried out on *Penicillium brevicaule*, *P. luteum*, *P. candidum*, and the *P.* sp. of Carbone and Cazzamalli (a description of which is given in 'Studi sulla etiologia della pellagra' by Carbone and F. Cazzamalli, *Rivista Sperimentale di Freniatria*, 1913), the author ascertained that very active inhibition of growth in culture was brought about by brilliant green (1 in 10,000 to 1 in 2,000), methyl violet (1 in 5,000 to 1 in 500), malachite green (1 in 2,000 to 1 in 500), and alizarin blue (1 in 2,000 to 1 in 1,000): crystal violet was effective (at 1 in 2,000) against *P. candidum* only. The most active metallic salts were mercury cyanide (1 in 40,000 to 1 in 20,000), mercuric chloride (1 in 20,000), cadmium nitrate (1 in 5,000 to 1 in 500), and aluminium sulphate (1 in 5,000 to 1 in 500). All the above-mentioned colouring agents and metallic salts were fungicidal *in vitro*, but not to any marked degree.

It is concluded that all species of *Penicillium* are very resistant *in vitro* to the action of colouring agents and metallic salts.

DATTA (S.). **A new fungus Eidamella actoni parasitic to the dog.**—Reprinted from *Indian Vet. Journ.*, viii, 10 pp., 2 pl., 1932.

From lesions on the skin of a dog in Calcutta the author isolated a fungus which in culture developed a mycelium with chandelier branching and perithecia. The chlamydospores were intercalary, lateral, and terminal: the intercalary and terminal ones were generally round, of various dimensions; the lateral ones less numerous, oval or piriform, and sessile or briefly pedicellate. Conidial bushes were also present. During the development of the perithecium, straight, septate spines grew out of a central mass, lengthened considerably, and narrowed almost to a point. Bodies resembling pectinate hyphae also developed in the central mass. The asci formed in the centre of the mass were numerous, round, and contained more than eight ascospores. The organism, while resembling *Eidamella spinosa*, differed from it in the septate spines and in the number of ascospores. It is provisionally named *E. actoni* [without measurements or diagnosis].

Inoculations into healthy dogs gave typical lesions, from which the fungus was re-isolated. From evidence accidentally obtained it is probably transmissible to man.

GREGER (J.). **Pergamentpapier als Träger von Schimmelpilzsporen.** [Parchment paper as a carrier of mould spores.]—*Zeitschr. für Untersuch. Lebensmittel*, lxiii, 5, pp. 560–564, 1932.

Writing in the *Oesterr. Milchwirtsch. Zeit.*, xxxviii, p. 46, 1931, K. Schuch describes a test with a parchment paper used for wrapping butter which was found to bear 614 mould spores per 100 sq. cm. After four days in the refrigerator the butter enclosed in this paper emitted a very musty smell, and after eight days a rancid and mouldy flavour was detected. This paper differed from

the other samples examined (those bearing 5 or 6 spores per 100 sq. cm. being designated as 'very good' and those with 78 as 'good') in containing a trace of iron.

In connexion with these statements the present writer obtained samples of parchment paper from the Olleschau factory at Prague (Czecho-Slovakia) and subjected them to various treatments (moistening with a nutrient solution or sterile tap water and holding in thermostats at 28° C., at a room temperature of 15°, and in refrigerators at 2° and 9°). No spores developed on any of the samples except in one case where a single colony was formed, probably due to infection contracted through handling in the tests, so that paper fresh from the factory may be regarded as free from mould contamination. When the samples were left exposed for 48 hours, those soaked in nutrient solution yielded about three spores per 100 sq. cm., while no growth was obtained on those moistened with sterile water, or on butter packed in these papers and held in a damp atmosphere. Butter from a shop was then wrapped in papers soaked in a nutrient medium and inoculated with pure cultures of *Penicillium glaucum* and *Aspergillus niger* [*R.A.M.*, xi, p. 181], but no infection developed, presumably owing to the use of a preservative. When butter was procured direct from a dairy, slight mould development occurred after three days in the thermostat, or five days at room temperature, in the samples wrapped in paper saturated with a nutrient solution. Where sterile water was used, however, no infection developed after 14 days, even after artificial inoculation. Paper obtained from a shop and treated with a nutrient solution developed eight centres of mould infection per 100 sq. cm. in five days in addition to bacteria.

It would appear from these results that there is no great risk of impairing the quality of butter by the use of parchment paper.

Heyes (T. F.) & Holden (H. S.). **An investigation of the action of certain species of Penicillium on artificial silk.**—*Journ. Textile Inst.*, xxiii, 5, pp. T79–T94, 1932.

A brief account is given of experiments in which five types of commercial artificial silk were subjected *in vitro* to the action of five species of *Penicillium*, namely, *P. pinophilum*, *P. lilacinum*, *P. purpurogenum* var. *rubri sclerotium*, and two undetermined species, one of which is closely related to the last-named. The results [which are presented in the form of tables] showed that acetate silk is more resistant to attack by these fungi than any other of the types tested, and that stretching in the spinning process appeared to confer some power of resistance to non-esterified silks. No correlation could be established between the degree of previous degradation of the cellulose and its susceptibility to the moulds. While considerable 'tendering' [*R.A.M.*, iv, p. 281; viii, p. 38] of the silk may result from the growth on it of the moulds, without any microscopically detectable injury, the type of damage that was visible under the microscope did not vary from one species of *Penicillium* to another for any one type of artificial silk. Non-esterified silks were damaged most severely by *P. purpurogenum* var. *rubri sclerotium* and its allied species, while *P. pinophilum*

did much less damage on them, in contrast to its behaviour on cotton which was attacked equally by all three of these species. The two first-named organisms normally cause the formation of additional reducing groups, presumably aldehyde groups, when acting on either cotton or non-esterified artificial silks.

LUDWIGS [K.]. **Vom Asternsterben.** [On the dying-off of Asters.]—*Blumen- und Pflanzenbau*, xlvii, 7, p. 108, 1932.

Popular notes are given on the dying-off or wilting of China asters [*Callistephus chinensis*] in Germany, associated with infection by *Fusarium* spp. and with defective cultural measures [*R.A.M.*, x, p. 315]. Suitable methods of control are briefly indicated.

SWIFT (MARJORIE E.). **Pythium crown- and stem-rot of Begonia.**—*Journ. New York Bot. Gard.*, xxxiii, 391, pp. 141–143, 1 fig., 1932.

A brief note is given in popular terms on the occurrence and control in New York of a virulent crown and stem rot of begonias due to *Pythium de Baryanum* [*R.A.M.*, vi, p. 359]. A rapid soft rot developed at the base of the stem or higher up, and soon the stalk collapsed. Inoculations with *P. de Baryanum* isolated from the affected plants caused healthy plants to collapse in four days.

CAYLEY (DOROTHY N.). **'Breaking' in Tulips. II.**—*Ann. of Appl. Biol.*, xix, 2, pp. 153–172, 2 pl., 1932.

A summarized account is given of the author's continued investigation of 'breaking' in tulips [*R.A.M.*, viii, p. 384], the results of which confirmed the infectious nature of the causal agent of the disease, which was transmitted by grafting and plugging bulbs with tissue from affected bulbs, but not by injections of filtered diseased sap. All attempts to induce 'parroting' by grafting gave negative results [cf. ibid., x, p. 599]. No correlation could be established between the type of 'break' exhibited by the plant from which the inoculum was derived (termed the 'transmitter') and the type of 'break' induced, and it was shown that different varieties vary in their susceptibility to infection with the agent derived from the same transmitter. 'Breaking' was observed to occur naturally under garden conditions in some other species of *Tulipa*, e.g., *T. eichleri* and *T. greigii*, and the condition was also induced in them by grafting with 'broken' garden varieties. The bi-colour Keizerkroon variety was found to be a true bi-colour, and not a 'break', but 'breaking' in the red areas of the perianth was caused by grafting with diseased material.

The effect of the virus on the colour plastids and the distribution of the anthocyanin sap-pigment [cf. ibid., xi, p. 183] is briefly discussed, and some data are given on the translocation of the virus in the bulb. The work also indicated the importance of insect control during the growing season and during storage for the prevention of the disease.

PRETI (G.). **Sulla presenza del 'Pythium de Baryanum Hesse' nelle piante di 'Cereus'.** [On the presence of *Pythium de Baryanum* Hesse in *Cereus* plants.]—*Riv. Pat. Veg.*, xxii, 5–6, pp. 121–132, 5 figs., 1932.

In September, 1931, young *Cereus grandiflorus, C. marginatus*, and *C. spachianus* plants growing under glass on the Italian Riviera were affected by a fatal wilt which had first been noticed on a few plants in the previous March and had gradually affected the whole nursery. The disease spread as a brown spotting and wilting from the base of the plants to the top.

The infected tissues contained a hyaline, non-septate, little branched mycelium, and, near the collar, spore-bearing external hyphae, 3·9 to 5·8 μ in diameter also developed. Conidia measuring approximately 20 μ and germinating by means of a germ-tube were formed within the tissues. The zoosporangia measured 24 to 30 μ and contained oval biciliate zoospores 29 by 14 μ in diameter. The mature oogonia (which were formed within the tissue) reached 23 to 28 μ in diameter and had a hyaline wall 2·9 μ thick. The oospores were round, 18 to 26 μ in diameter, and completely filled the oogonia. The straw-coloured antheridia were somewhat clavate, with a thickened epispore. The fungus is provisionally identified as *Pythium de Baryanum* (*sensu lato*).

Experimental evidence demonstrated that excessive, persistent humidity was necessary for infection.

Brief, practical notes are given on control, and a bibliography of 23 titles is appended.

NATTRASS (R. M.). **Cercospora disease of Calotropis procera.**—*Min. of Agric. Egypt. Tech. & Sci. Service Bull.* 106, 6 pp., 7 pl., 1932.

Calotropis procera, a common ornamental plant in many parts of Egypt, is liable to severe infection by a species of *Cercospora*, the pathogenicity of which was established by inoculation from pure cultures.

During the latter part of May and early June, circular, water soaked lesions, 7 mm. or more in diameter, appear on the leaves. With the production of conidiophores and conidia the spots turn dark olive (Ridgway) with a paler margin on the upper surface and yellowish-olive on the lower. Towards the end of the summer most of the infected leaves are shed, but a few remain attached to the plant during the winter and serve to perpetuate the fungus. The primary outbreaks of the next season are due to the conidia developing in profusion on the water soaked zones surrounding the old dried areas on the leaves. Infection normally takes place through the stomata.

The fasciculate, slightly flexuous, light brownish-olive, non-septate conidiophores, measuring 33 to 45 μ in length, arise from a characteristic stromatic mass of hyphal tissue. The straight or slightly curved, pale yellowish-olive, subcylindrical to abruptly obclavate, 1- to 3-, occasionally 4- or 5-septate conidia are of variable size, measuring 35 to 54 by 5 to 8 μ in the early summer, 38 to 93 μ in length in September, and up to 100 μ long towards the end of the season.

A comparison of the Egyptian organism with what is believed to be the type material of *C. calotropidis* from the Herbarium of the Missouri Botanical Garden left no doubt as to the identity of the two forms. The synonyms of *C. calotropidis* are given as *C. microsora* Pat. non. Sacc. [*R.A.M.*, viii, p. 347], *C. patouillardi* Sacc. et D. Sacc. [ibid., x, p. 693], *C. inconspicua* Pat. et Har., *Napicladium calotropidis* Morstatt, and *C. domingensis* [ibid., vi, p. 259].

PHILIPP (W.). **Woher der schlechte Kleestand?** [Whence the poor Clover stand?]—*Die Kranke Pflanze*, ix, 6–7, pp. 61–63, 1932.

A brief, popular account is given of what is commonly called 'winter injury' of clover, in reality due to the attacks of *Sclerotinia trifoliorum*, in Germany [*R.A.M.*, x, p. 669], the damage from which was very severe during the season of 1931–2. Control measures, based on crop rotation and suitable cultural methods, are briefly indicated.

KUSANO (S.). **The host-parasite relationship in Olpidium.**—*Journ. Coll. Agric., Imper. Univ. Tokyo*, xi, 4, pp. 359–426, 10 figs., 1932.

Olpidium trifolii and *O. viciae*, which are found in the field in Japan only on white clover (*Trifolium repens*) and *Vicia unijuga*, respectively [*R.A.M.*, viii, p. 580], infected a number of other leguminous plants through wounds, under laboratory conditions, including clovers, groundnut, *Vicia faba*, *Phaseolus angularis*, lucerne, *Vicia sativa* var. *angustifolia*, yellow lupin (*Lupinus luteus*), French bean (*P. vulgaris*), soy-bean (*Glycine soja*), cowpea (*Vigna catjang* var. *sinensis*), peas, and *Sophora japonica*, besides attacking pieces of living tissue of 63 out of 81 species of phanerogams of various families tested. Some of the plants reacted by the formation of tumours, while in others there was no external sign of infection, though the fungus often developed normally and liberated gametes after the usual period of maturation. The latter, therefore, may act as carriers of the fungi, being susceptible to infection but resistant to, or immune from any resulting disease. The hosts reacting in the former manner to *O. viciae*, namely, *V. unijuga*, *V. faba*, and peas are of the latter type in respect to infection by *O. trifolii*, and vice versa.

The effect of the fungi on the hosts is similar whether the epidermis or the internal cells on the wound surface are attacked. Further tests on the young unwounded epidermis showed that each fungus can penetrate the epidermal cells of the hosts of the other, but the invaded cell does not enlarge and the development of the fungus is not so vigorous (though it may reach maturity) as in cells exposed by wounding. *O. viciae* caused typical tumours on *Vicia faba* and pea seedlings or young shoots, though it has not yet been observed in nature on these hosts. *O. trifolii* caused only small necrotic spots on these hosts, but formed galls on *T. pratense* and *T. incarnatum* when care was taken to inoculate young tissues. On a number of other Leguminosae tested the

fungi penetrated and developed but no external symptoms were produced.

All parenchymatous tissues from the various plants liable to infection exert an apparent positive chemotaxis on the swarm cells (gamete and planozygote). The juices of the plants in question were also found to contain the chemotactic substance. Potassium compounds were the only ones of several water-soluble substances examined to induce positive chemotaxis on the swarm cells of both organisms. The wide host range may be attributed to the universal occurrence of potassium in the higher plants, and especially in the susceptible young internal cells of the shoot and root. The resistance of some plants may be due to the secretion of substances injurious to the approaching swarm cells, while in other cases the protoplasm of the host is uncongenial to the parasite. Many susceptible plants may remain unaffected in nature, since their morphological and anatomical characters, growth forms, or habits prevent the penetration of their susceptible cells by the fungi.

Specimens determined as follows and occurring in Czecho-Slovakia were sent to the author by Dr. E. Baudyš: *Synchytrium* (*Olpidium*) *trifolii* on *Trifolium repens* and *Urophlyctis bohemica* Bubák on *T. repens*, *T. hybridum*, and *T. montanum*. All these, however, were clearly *O. trifolii* as it occurs in Japan. The diseased spots on *T. montanum* are similar to those observed by Bubák (*Zentralbl. für Bakt.*, Ab., 2, viii, p. 817, 1902) as caused by *U. bohemica*, but the fungus present in the specimen examined was clearly not the same as that described and figured by Bubák. It is evident that this plant is attacked by two distinct fungi causing similar symptoms.

Scholz (W.). **Bisherige Forschungsergebnisse betreffend die Chlorose der gelben Lupine (Lupinus luteus) in ihrer Beziehung zum Eisen. (Vorläufige Veröffentlichung.)** [Results so far obtained from researches connected with chlorosis of the yellow Lupin (*Lupinus luteus*) in its relation to iron. (Preliminary publication).]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxv, 5–6, pp. 287–293, 1932.

The work of previous investigators on chlorosis of the yellow lupin (*Lupinus luteus*) in Germany [*R.A.M.*, ix, p. 742] is summarized, and a preliminary announcement made concerning the writer's studies in Silesia, which are stated to have shown that it is directly correlated with iron deficiency.

Guyot (A. L.). **Observations sur la distribution géographique comparée de quelques espèces végétales et de certains de leurs parasites naturels. (2e Note). Sur quelques champignons parasites des Graminées.** [Observations on the comparative geographical distribution of some plant species and of certain of their natural parasites. (2nd Note). On some fungi parasitic on Gramineae.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 2, pp. 36–47, 1 pl., 1932.

In this further account of studies on the geographical distribution of plant parasites and their natural hosts [cf. *R.A.M.*, x, p. 274] the author states that early in the winter of 1931 he noted

near Beauvais (Oise) a greyish-violet, later black spotting of the young green leaves of *Agrostis alba* var. *stolonifera*, caused by a fungus with simple, brown-olivaceous conidiophores measuring 29 to 44 by 6 to 8 μ. The single, terminal, subspherical to spherical, brown-olivaceous conidia were 11 to 13·5 μ in diameter. Perithecia developed as single or multiple loculi in a subepidermal stroma; they were usually present only on the upper surface of the leaf, and were depressed, later erumpent. The oblong-elongated, sometimes slightly curved, uniseptate, hyaline ascospores measured 15 to 23 by 5 to 7 μ (average 19·6 by 6·3 μ).

The conidial stage approached nearest to *Hadrotrichum virescens* Sacc. et Roum. [ibid., iv, p. 17] reported on *A. vulgaris* in Bohemia, on *Lolium perenne* in Holland, and on an undetermined grass in the Ardennes. Saccardo's *H. agrostidis* is close to this fungus. *H. microsporum* Sacc. et Malbr. var. *macrosporum* Karst. reported in Scandinavia on *A. alba* is, in the author's opinion, only a pale-spored form of *H. virescens*. All these forms should fall into the one species, which by reason of priority should be named *H. virescens* Sacc. et Roum. The perfect stage is referred to the genus *Scirrhia*, and most closely approaches *S. agrostidis* Wint., [ibid., vii, p. 642] found on *A. stolonifera* in central Europe and on *A. rivularis* in Portugal, though the average ascospore dimensions of the type (24 by 8 μ) are larger than those found by the author. Saccardo's *H. agrostidis* was regarded by him as the conidial stage of this fungus, which he termed *Dothidella agrostidis* (Fuck.) Sacc. (= *Phyllachora agrostidis* Fuck.). Winter's reference of the fungus to the genus *Scirrhia* is, however, preferred by the author.

Notes are also given on *Phyllachora sylvatica* on the living leaves of *Festuca duriuscula* [*F. ovina*] at Bury (Oise), *Physalospora festucae* on the leaves of *Melica uniflora* at Famechon (Somme), and *Puccinia ammophilae* n. sp. on *Ammophila arenaria* [*A. arundinacea*] at Cayeux (Somme). The fungus previously reported as causing a witches' broom of *Silene maritima* [ibid. x, p. 745] was definitely identified as *Uromyces behenis*.

NIETHAMMER (ANNELIESE). **Die Beizwirkung von Germisan auf die Keimung einzelner Wiesengräser bei unterschiedlichen Keimtemperaturen.** [The steeping action of germisan on the germination of certain meadow grasses at different germination temperatures.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xlii, 7–8, pp. 364–383, 1932.

Seed of the meadow grasses, *Poa*, *Festuca*, and *Trisetum* spp. exposed to varying temperatures (2° to 25° C.) after one hour's immersion in 0·125 or 0·25 per cent. germisan underwent, generally speaking, no far-reaching injury, such as marked protraction of the germination period or appreciable reduction of germinative capacity. The effects of the treatment, however, vary to some extent with the particular conditions of germination [full details of which are shown in the 15 tables supplementing the discussion]. Treated seed subjected to the action of frost (12 to 14 hours in a refrigerator at −10°) was liable to a reduction of germination not observed in the untreated. On the whole, the results of these

experiments are considered to justify the disinfection of meadow grass seed.

The permeability of the grass seeds and of Gold oats to various dyes (0·1 per cent. methylene blue, chrysoidin, and orange G) was studied, and it was found that, as in the case of wheat, but to a much greater extent, the substances accumulate in the pericarp at the tip of the seed [cf. *R.A.M.*, x, p. 256]. Chrysoidin was the only one to penetrate the interior of the seed through the testa after 16 hours, and not until the end of 30 hours' immersion did small amounts of the other dyes gain entry. The embryo, therefore, is well protected from injury. Assuming that germisan behaves similarly to these dyes in regard to the penetration of the seed, no damage from this source need be anticipated.

ARK (P. A.). **The behaviour of Bacillus amylovorus in soil.**—*Phytopath.*, xxii, 7, pp. 657–660, 1 fig., 1932.

A specialized technique was adopted for the isolation of the pear blight organism (*Bacillus amylovorus*) from naturally and artificially infested Californian soils. In order to inhibit the Gram-positive organisms present in large numbers in unsterilized soil, Patel's ox-gall medium was used [containing sodium taurocholate: *R.A.M.*, vi, p. 19; xi, p. 561], with crystal violet in the proportion of 1 in 100,000 instead of 1 in 500,000. Superficially sterilized green pear fruits or parts of fruits were punctured with needles and immersed in suspensions of the soils to be tested, and then removed and incubated at a temperature favourable to the growth of *B. amylovorus*. The organism was found to persist for 54 days in sterilized loam and clay soils at 8° C. and for 30 days at 21° and 28°; in sandy soil it lived for 18 days at 8° and 21° but was killed immediately at 28°. In unsterilized samples the duration of viability was 30 days in loam at all temperatures, 38 in clay at 8° and 21° and 14 at 28°, and 14 22, and 18 days in sand at 8°, 21°, and 28°, respectively. *B. amylovorus* was isolated from moderately moist or dry orchard soils under conditions indicating persistence for at least several weeks (up to seven or eight months in one case).

JENKINS (ANNA E.). **Elsinoe on Apple and Pear.**—*Journ. Agric. Res.*, xliv, 9, pp. 689–700, 3 pl., 1 fig., 1932.

Continuing the study of *Plectodiscella piri* [*R.A.M.*, viii, p. 469] the author states that the examination of material sent in by various workers and also of the fungus on apples and pears intercepted on arrival in the United States from different European countries leads her to interpret the structures which were described by Woronichin under the term 'epithecium' or 'shield' as being agglomerations of the conidiophores of its *Sphaceloma* stage. In a comprehensive review of the history and taxonomy of the organism she shows that the reasons advanced by Woronichin for not placing it in the genus *Elsinoe* are not valid, the same also applying to Theissen's and Sydow's reason for separating the families Elsinoeaceae and Plectodiscellaceae. Arnaud's transference of *Elsinoe* to the genus *Uleomyces* still wants confirmation [cf. ibid., x, p. 578]. For all these reasons she places *P. piri* in

the genus *Elsinoe* which she maintains as a distinct genus, with *Plectodiscella* and *Melanobasidium* as synonyms. *P. piri* thus becomes *E. piri*; and *U. piri*, *Gloeosporium pirinum*, *Hadrotrichum piri*, *H. populi* var. *piri*, *H. pirinum*, and *Melanobasidium mali* are synonymous with it. *P. veneta* is renamed *E. veneta* n. comb. [cf. ibid., ix, p. 66].

Reference is made in the paper to the *Sphaceloma* stage of *Plectodiscella* spp. on various plants, most of which have not heretofore been reported as hosts for this group of fungi. Examination of typical material of *H. populi* [ibid., iii, p. 746] on *Populus nigra* shows that this fungus possesses the characteristics of the genus *Sphaceloma* and is possibly a distinct species; it is therefore renamed *S. populi* (Sacc.) n. comb.

In discussing the distribution of *E. piri* it is stated that so far the fungus is not known to occur in the United States.

ANDERSSEN (F. G.). **Chlorosis of deciduous fruit trees due to a copper deficiency.**—*Journ. Pomol. and Hort. Science*, x, 2, pp. 130–146, 5 pl., 1932.

A brief account is given of a diseased condition of deciduous fruit trees in South Africa, which occurs almost exclusively on deep, well-drained, light sand or sandy loam soils, either poor or rich in humus, with an acid reaction (P_H 5·5 to 6·5). The symptoms vary considerably from one kind of fruit tree to another. Most plums, peaches, and apricots exhibit a marked yellowing of the leaves, the interveinal areas being very pale green to bright yellow, and in extreme cases the smaller veins being also discoloured. This is accompanied by a serious rosetting with cessation of terminal growth, formation of multiple buds, and dying back of the branches. The Gaviota plum appears to be more resistant than most varieties, and the Kelsey and Wickson the most susceptible. Early varieties of peaches seem to be more susceptible than later ones. While pears and apples do not exhibit yellowing of the leaves very often, the rosetting is very conspicuous in the apples and the leader branches die back; rosetting is absent in the pears, but the tips and apical leaves become badly scorched, resulting in die-back. Very often one half of a large tree becomes affected a year or two before the other half. The roots of diseased trees appear quite normal externally. The cropping capacity of the affected trees is considerably reduced or may even be destroyed. Attempts to remedy the condition with applications to the soil of fertilizers containing potassium, manganese, magnesium, sulphur, and iron gave negative results in every case.

Chemical analysis of plant material from affected trees consistently showed a deficiency of copper, which was traced from the leaves and fruits down to three-year-old bark and wood, and to the roots. The ash content of the chlorotic material was always much higher than that of normal material. Experiments in the Ceres district of the Western Cape Province indicated that the trouble is amenable to treatment by applications to the soil of copper in the form of copper sulphate at the rate of from $\frac{1}{4}$ to 2 lb. per tree. Leaves dipped in a very dilute solution of copper sulphate resumed their green colour within two weeks.

MARSH (R. W.) & WALKER (MARY M.). **The scab fungus (Venturia inaequalis) on Apple shoots.**—*Journ. Pomol. and Hort. Science*, x, 2, pp. 71–90, 2 pl., 2 diag., 1932.

The investigation reported in this paper was made at the Long Ashton Research Station near Bristol for the purpose of supplying the lack of information in the literature [a cursory review of which is given] concerning the early stage of shoot infection by the apple scab fungus (*Venturia inaequalis*) [*R.A.M.*, ii, p. 318; x, p. 37; xi, p. 50]. As seen on the Apple variety Lord Suffield, the only noteworthy departure from the processes accompanying the germination of the spores and the penetration of the host cuticle, as described by Wiltshire for leaf infection, is that in shoot infections the appressorium is little developed and sometimes absent. In the latter, the infection hypha, growing between the cuticle and the epidermis, first branches to form a thin plate of cells which eventually develops into a lens-shaped pseudoparenchyma forcing the cuticle and epidermis apart. The epidermal cells in contact with the fungus collapse, and by the end of the first week from infection these cells are invaded. At a slightly later stage the subepidermal cells are also killed, and a pad of pseudoparenchymatous fungal tissue (stroma) is rapidly formed and forces the bark outwards. This invasion continues into the surrounding epidermal cells and is not checked when the epidermis becomes the phellogen, but the further development of the stroma is affected by the formation of cork barriers in the host tissues, and while the invasion continues to spread tangentially, it remains during summer confined radially by the bark tissues above and the collenchyma below. The cork barriers may enclose the stromata completely, in which case the latter wither and may be shed, together with the remains of the host tissues external to the barrier, but frequently a vigorously developing stroma may outgrow the barrier, so that although the central mass of the stroma is cut off and dries up, small masses of mycelium remain unenclosed by the cork barrier. During winter the fungus continues to grow between the collenchyma and the bark, and forms subsidiary pustules, from which a deeper penetration takes place along the line of the phellogen from which the first cork barrier arose. This affords protection to the subsidiary pustules, which are the only organs of the fungus that produce spores for the renewal of infection in the following spring. In the second year of infection, the abscission of infected tissue is much more rapid than the gradual formation of the cork barriers of the previous late summer and autumn, and only very rarely does any living portion of an infection persist on a shoot beyond the summer following that of its initiation. The direct damage caused by scab to the shoots is slight, but the importance of scabbed wood lies in its effect on spring infection of the leaves.

The rest of the paper is a brief discussion of the external conditions influencing the course of infection on the Lord Suffield variety, the dissemination of spores from scabbed shoots, and the variations observed in scab attack on shoots of some varieties other than Lord Suffield. A brief reference is also made to the difficulty of killing the scab pustules on the shoots by direct spraying.

PARKS (T. H.). **The Ohio spray service.**—*Journ. Econ. Entom.*, xxv, 3, pp. 543–544, 1932.

In giving a brief outline of the work done by the Ohio Spray Service, the author states that it is chiefly concerned with the proper timing of the treatments for the control of apple scab [*Venturia inaequalis*: *R.A.M.*, xi, p. 654] and codling moth. It is further stated that apple growers who strictly adhered to the spray schedules recommended by the service, produced 86·4 per cent. absolutely clean fruit in 1930, rising to 89·9 per cent. in 1931, in spite of the fact that codling moth in both years was quite serious.

WORMALD (H.). **Bacterial canker as a cause of dieback in Plum trees.**—*Journ. Min. Agric.*, xxxix, 3, pp. 208–217, 4 pl., 1 fig., 1932.

This is a popular version of the author's account of the die-back of plum trees in England, caused by *Pseudomonas mors-prunorum* [*R.A.M.*, xi, p. 379]. The disease, which is apparently present in most of the districts where plums are grown, is particularly severe on Victoria and Czar plums, and Bradley's King damsons, but most of the varieties commonly cultivated appear to be susceptible to it; so far, however, it has not been recorded at East Malling on the varieties Utility, Monarch, and Diamond. Besides the stems and limbs of the trees, the disease also causes a spotting of the shoots, leaves, and fruits, and there was evidence that the organism lives over the summer, during which it dies out from the stem and branch cankers, on the green organs, whence in the autumn it again infects the stems and branches. Preliminary tests have shown that most of the similar cankers found on sweet cherry, Morello cherry, peach, and some other stone-fruit trees, are also caused by *P. mors-prunorum*.

Tentative recommendations for the control of the disease, based on the biological characters of the organism, are appended.

OGILVIE (L.). **Hard rot of Strawberry fruits.**—*Ann. Rept. Agric. & Hortic. Res. Stat. Long Ashton, Bristol, for 1931*, p. 118, 1 pl., [1932.]

In 1930 and 1931 a large proportion (amounting to 80 per cent. in the former year) of Paxton strawberries in Herefordshire were rendered unfit for canning through the formation of hard, brown, sunken areas with a large number of seeds.

The disease on the fruits was associated with a *Septoria* which also produced roughly circular leaf spots, about 0·5 cm. in diameter, with brown centres and reddish-purple margins. These spots bore black, sunken pycnidia about 100 μ in breadth and 125 μ in height. The cylindrical, obtuse, usually 3-septate conidia were slightly constricted at the septa and averaged 40 by 5 μ.

Small purple spots sometimes appeared on the sepals, which later became brown and covered with pycnidia; this condition led to the infection of the green fruits and the development of the hard areas. Much damage was also caused by shrivelling of the flower-stalks and flowers.

The fungus, which was obtained in pure culture, was provi-

sionally identified as *S.* [*Mycosphaerella*] *fragariae* [*R.A.M.*, x, p. 584].

Tests indicated that some control is possible by spraying before fruiting with Bordeaux mixture.

THOMAS (H. E.). **Verticillium wilt of Strawberries.**—*California Agric. Exper. Stat. Bull.* 530, 16 pp., 4 figs., 1932.

This is an expanded account of the writer's investigations on the strawberry wilt caused by *Verticillium albo-atrum* in California, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 187].

ZELLER (S. M.). **Armillaria crown rot of Strawberry.**—*Phytopath.*, xxii, 7, pp. 665–666, 1 fig., 1932.

Several cases of localized patches of crown rot of the Marshall strawberry due to *Armillaria mellea* have been examined west of the Cascade Mountains, Oregon [*R.A.M.*, x, p. 163]. The diseased plants (about 17 per cent. of the total patches) were somewhat dwarfed and showed considerable yellowing of the leaf mesophyll. The site of one of the plantings studied was formerly occupied by oaks, while that of another had previously borne a mixture of oaks (*Quercus garrayana*) and various shrubby trees. In the former case the infected plants were scattered over the area of five acres, resulting in a loss of some 6 per cent., while in the latter the disease was uniformly distributed and affected about 23 per cent. of the plants covering seven acres. Cultures have been made from 196 plants which yielded 144 (73·5 per cent.) isolations of *A. mellea*.

DARROW (G. M.). **Varietal resistance to the 'double blossom' disease of the Blackberry in North Carolina.**—*Plant Disease Reporter*, xvi, 1, pp. 3–4, 1932. [Mimeographed.]

In eastern North Carolina and southwards blackberries and dewberries are liable to severe damage from 'double blossom' [*Fusisporium rubi*]. The wild blackberry (*Rubus* (?) *floridus*) and the red-caned dewberry (*R. trivialis*) are commonly infected, while the sand blackberry (*R. cuneifolia*) is practically immune. On 1st May, 1931, over 99, over 90, and 50 per cent. infection was observed on the common British, Oregon Evergreen (*R. laciniatus*), and Evergreen × Himalaya blackberry varieties, respectively, while Himalaya, Burbank Thornless, and Nanticoke were completely healthy and Brainerd (Himalaya × erect) showed only 1 per cent. of double blossom. Five per cent. infection was found on one lot of Mammoth selfed dewberries, two others being healthy, as also were Austin Thornless and young plants from which the old and new canes were cut off after the 1930 harvest.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Pitting disease of Bananas. Its nature and control.**—*Trop. Agriculture*, ix, 6, pp. 193–195, 1932.

The re-investigation of the transit wastage in banana cargoes from Brazil to England [*R.A.M.*, xi, p. 189] is claimed by the authors to have established that it is primarily due to infection

(invisible at the time when the fruit is put in cold storage prior to transport) of the bunches in the plantations with *Piricularia grisea* [ibid., vi, p. 637], a fungus which hitherto was chiefly known as pathogenic to rice and other Gramineae. This was clearly shown in cold storage tests in Santos, Brazil, in which apparently healthy bunches of the Cavendish, Giant Fig, and Silk varieties were found on their removal to the ripening room to have developed spotting or pitting typical of the trouble, chiefly on the cushions and finger stalks of the two top hands, and occasionally on the finger stalks of the third and fourth hands. A similar localized infection was also present down one side of the main stalk and, in some bunches, towards the distal ends of the individual fruits (fingers). Isolations from the lesions in their earliest stage of development repeatedly gave pure cultures of *P. grisea*, which was also found sporulating abundantly on the spots after a few days in the ripening room. While the radial spread of the organism in the banana tissues is strikingly localized, the underlying tissues are usually deeply penetrated, this preparing the way for invasion by secondary fungi, e.g., *Gloeosporium musarum* and *Fusarium* sp., which cause rapid decay and soon lead to finger dropping and other wastage in transit.

The investigation also indicated that in the Brazilian banana plantations the infection with *P. grisea* originates in the 'transition' or 'protecting' leaves (the last of the series of green vegetative leaves immediately overhanging the bunches) and bracts, which were found in most cases to be abundantly infected; from these the spores are carried to the bunches by the downward passage of atmospheric water. The precise time at which infection of the finger stalks and cushions occurs has not yet been determined, but it has been definitely shown that the infections of both *P. grisea* and *G. musarum* remain latent or dormant until the fruit is reaped and placed in storage.

In the light of these observations, the trouble may be controlled by weekly or fortnightly inspection (according to the prevailing weather conditions and the number of new bunches being formed), during which the 'transition' leaves should be removed by means of a sharp knife, and the bracts protecting the hands carefully detached. This treatment is stated to be very simple and quite inexpensive. Sun scorch of the bunches may be avoided by bending down an overhanging leaf.

REICHERT (I.) & HELLINGER (E[STHER]). **On Botrytis tip-end rot of Banana fruits in Palestine.**—*Hadar*, v, 7, pp. 162–163, 2 figs., 1932.

Botrytis cinerea attacks the floral end of banana fruits in Palestine rather commonly during the wet winter months, producing a dark brown discoloration as it progresses towards the stem end. The brown rot is generally preceded by a clear watery band. The withered floral leaves and the large bracts protecting the flowers and the fruit 'hands' are also liable to infection. Inoculation experiments on healthy green banana fruits, wounded and unwounded, gave positive results. *B. cinerea* has previously been found attacking roses and citrus in Palestine [*R.A.M.*, viii,

p. 236], but this is stated to be the first record of its occurrence on banana. Attention is drawn to the likelihood of diseased bananas serving as a source of infection to the citrus groves with which they sometimes are interspersed.

NICOLAS (G.) & AGGÉRY (Mlle). **Une maladie grave du Néflier du Japon.** [A serious disease of the Loquat.]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xxiii, 4, pp. 101–105, 1932.

In this further account of the infection of loquat (*Eriobotrya japonica*) at Toulouse by an organism closely agreeing with *Bacillus amylovorus* [*R.A.M.*, xi, p. 305] the authors, who give the dimensions of the organism as 1 to 1·5 by 0·5 to 0·8 μ, state that in 1932 identical symptoms appeared on other loquats in the same garden as well as on some in a distant suburb. The disease was also reported at about the same time from Palermo [ibid., xi, p. 117].

CROSBY (C. R.). **The spray service in New York.**—*Journ. Econ. Entom.*, xxv, 3, pp. 539–542, 1932.

In this paper the author gives a brief outline of the organization and activities of the Spraying Service for the control of fruit, potato, and vegetable diseases in the State of New York, which is conducted jointly by the departments of Entomology and Plant Pathology. In issuing notices timing the spray applications every possible source of information is made use of by the agents of the Service, who are greatly assisted in their work by the co-operation of the United States Weather Bureau. A special forecast is prepared each evening during critical periods and sent to each county agent. Besides purely practical purposes, the Service also pursues educational aims, by giving lectures in the early spring to the local growers, in which all the problems of insect and disease control likely to arise are thoroughly discussed.

MARTIN (H.). **The laboratory examination of fungicidal dusts and sprays.**—*Ann. of Appl. Biol.*, xix, 2, pp. 263–271, 1 graph, 1932.

This is a brief discussion of the advantages and drawbacks presented by laboratory tests of the efficacy and toxic action of fungicidal sprays and dusts used in the control of plant diseases. While capable of giving much more accurate and definite data than field trials, it is pointed out that the practical value of laboratory experiments is entirely dependent on the correctness of the allowances made for the influence of the variable factors that operate in the field.

MCCALLAN (S. E. A.) & WILCOXON (F.). **The precision of spore germination tests.**—*Contrib. Boyce Thompson Inst.*, iv, 2, pp. 233–243, 1 graph, 1932.

In stressing the importance of accuracy in spore germination tests in relation to the evaluation of the toxic properties of fungicides in the laboratory, the authors state that the variations that usually occur in replicate tests are due either to lack of uniformity in the experimental conditions or to a factor known in variational statistics as 'errors of random sampling'. While the latter factor

is unavoidable, the former may be reduced to a negligible quantity by careful technique, and a method is indicated (the χ^2 test) by which it is possible to determine to what extent such errors have been eliminated. This test was applied by them to the results (covering a total of 160,000 spores germinated in the presence of various fungicides) obtained with three species of fungi, namely, *Sclerotinia americana*, *Pestalozzia stellata*, and *Uromyces caryophyllinus* [*R.A.M.*, x, p. 742], and it was found that in the case of the two first-named the errors due to faulty technique were negligible, while with the last, where the fungicide was subjected to artificial rain before germination of the spores [ibid., xi, p. 385], the results were more variable. A discussion is given of the form of toxicity curves and of the theories underlying them [cf. ibid., iii, p. 536].

SEMPIO (C.). **Meccanismo di azione dello zolfo nella lotta contro le Erisifacee.** [The mechanism of the action of sulphur in the control of the Erysiphaceae.]—*Ann. di Tecnica Agraria*, v, 1, pp. 4–60, 1932.

After briefly discussing various theories which have been put forward to explain the fungicidal action of sulphur [*R.A.M.*, xi, p. 195], the author gives a full account of his investigations into the subject, using the conidial stage of *Erysiphe graminis* as the test fungus.

At temperatures from 12° to 57° C. sulphur did not give rise to acid compounds when exposed in a thin layer to sunlight in various conditions, or when sprinkled on wheat leaves, and it is thought, therefore, to be toxic only in the molecular stage.

Sulphur is considered to act chiefly by contact; the gases which emanate from it attain sufficient pressure to be toxic only in its immediate vicinity, though they may assist in the destruction of the fungus on the parasitized, treated organs of the host. The marked fungicidal activity of the sulphur colloids results from the fact that when they pass into very fine suspension in water they effect contact with the fungus over a very large area.

The fungicidal efficacy of sulphur is not affected by the P_H value of the medium to which it is exposed, and therefore cannot be due to those compounds of the metalloid which are destroyed when the P_H value passes above or below certain narrow limits.

Sulphuric acid solutions at concentrations of 0·1 to 0·2 per cent. slightly weakened the germinative power of the conidia of *E. graminis* but produced a much more destructive effect on the host tissues. Solutions of sulphurous acid at concentrations of 0·1 to 0·2 per cent. stimulated germination of the spores but killed wheat leaves in a few hours. If these acids were formed on green tissues treated with sulphur they would therefore injure the host much more than the parasite.

Solutions of sodium thiosulphite (0·5 to 1 per cent.) had no effect on the conidia of *E. graminis*.

Solutions of sulphuretted hydrogen as dilute as 0·04 to 0·07 per cent. were markedly fungicidal to the conidia of *E. graminis*, while being perhaps less injurious to green host tissues than sulphurous or sulphuric acid solutions.

If acid compounds of oxidization were formed in nature on the

sulphur-treated green organs of the host such compounds would not injure the parasite, and might actually stimulate it.

The only compound which can be formed by sulphur in small quantities while the mycelium is decomposing under the effect of the metalloid and which might be injurious to the fungus is sulphuretted hydrogen, but the rapid dispersion and marked instability of this gas are such that even if small quantities did form on the green host organs, they could have only quite a secondary importance in destroying the fungus, as the gas would not have sufficient time to reach the minimum pressure at which it is toxic to *E. graminis*.

The fact that, excepting sulphuretted hydrogen, all the sulphur compounds were very slightly toxic to *E. graminis* or even, in small doses, favoured germination of the conidia, confirms the view that it is only the elementary form of sulphur which is specifically and markedly toxic to the Erysiphaceae.

The action of sulphur upon *E. graminis* has two aspects: it almost completely inhibits the germination of the conidia, while at the same time it rapidly destroys the mycelium.

Natural sulphurs are also markedly fungicidal against *E. graminis*, and provided they contain not less than 20 to 25 per cent. sulphur may safely be substituted for the refined product [loc. cit.].

SEMPIO (C.). **Sulla interpretazione del meccanismo intimo di azione dello zolfo come anticrittogamico.** [On the interpretation of the intimate mechanism of the fungicidal action of sulphur.]—*Mem. Reale Accad. d'Italia, (Roma), Classe di Sci. Fis., Mat., e Naturali*, iii, *Biol.* 2, 30 pp., 1932.

In this further account of his investigations into the mechanism of the fungicidal activity of sulphur [see preceding abstract] the author gives a full description of experiments made to ascertain whether compounds are formed when sulphur is exposed in a thin layer to very different environmental conditions and of tests of the toxicity to the conidia of *Erysiphe graminis* of common ground sulphur and most of its compounds under different conditions. From the results obtained [which are discussed in detail, and with reference to those reached by other workers] the author concludes that elementary sulphur acts by penetrating unchanged into the fungal cells, that this penetration is facilitated by the presence of oxygen, and that once having entered the cells the sulphur kills them, either, as is more probable, directly, and without undergoing chemical change, or indirectly, with the formation of reduction compounds.

An exhaustive bibliography is appended.

[An English translation of this paper has been issued by the Boyce Thompson Institute, Yonkers, New York.]

MARTIN (H.) & SALMON (E. S.). **The fungicidal properties of certain spray-fluids, IX. The fungicidal properties of the products of hydrolysis of sulphur.**—*Journ. Agric. Sci.*, xxii, 3, pp. 595–616, 1932.

Further investigations at the South Eastern Agricultural College,

Wye, Kent, into the fungicidal properties of spray fluids [cf. *R.A.M.*, xi, pp. 253, 464] with special reference to the effect exercised upon the conidia of *Sphaerotheca humuli* by the sulphur compounds likely to be formed by the alkaline hydrolysis of sulphur showed that sodium sulphite, applied with 0·5 per cent. gelatine or 0·5 per cent. agral I as spreader was fungicidal at a content of 0·25 per cent. sulphur but not at 0·16 per cent. At these concentrations the solutions injured the hop leaves.

Calcium bisulphite solutions (1 in 50) with a 0·1 per cent. sulphite sulphur content, applied with 0·5 per cent. gelatine, were non-fungicidal and non-injurious to the leaves.

A suspension of calcium sulphite (5 per cent.) and agral I (0·5 per cent.) was non-fungicidal and non-injurious to the leaves.

Neutralized solutions of 0·3 per cent. hydrosulphite sulphur applied with gelatine or agral I before the disappearance of the reducing properties were fungicidal, but those of 0·15 per cent. were not. Leaf injury appeared to be less severe than with aqueous solutions of sodium metabisulphite, but at the 0·15 per cent. concentration injury was not always prevented by neutralization with calcium hydroxide.

Sodium formaldehydesulphoxylate (1 per cent.) with 0·5 per cent. gelatine and sodium formaldehydesulphite (1 per cent.) were non-fungicidal and highly injurious to the leaves.

Sodium thiosulphate at a concentration of approximately 0·25 per cent. thiosulphate sulphur, applied with agral I, was non-fungicidal and non-injurious.

Calcium thiosulphate solutions containing 0·5 per cent. thiosulphate sulphur and 0·5 per cent. agral I checked the regrowth of the fungus but were ultimately non-fungicidal.

Sodium sulphide solutions containing 0·25 per cent. monosulphide sulphur and 0·5 per cent. soft soap or agral I were fungicidal, but not when they contained only 0·13 per cent. monosulphide sulphur. At both concentrations the leaf tissue under the mildew patches was killed and showed a purplish-brown spotting. At the higher concentration, injury was sometimes produced on the edge of the leaf and on leaves lower down on which the fluid dripped. These solutions liberated hydrogen sulphide (sulphuretted hydrogen) after spraying, and the response of the fungus to this gas could be estimated by comparison of the sprayed leaves with controls treated with equivalent solutions of sodium hydroxide and sodium carbonate. These had the same effect on the mildew as the sodium sulphide solutions, but the leaf tissue appeared to be more severely injured.

Calcium hydrogen sulphide at a concentration of 0·5 per cent. monosulphide sulphur with 0·5 per cent. agral I was non-fungicidal and non-injurious.

Calcium sulphide (sulphurated lime) 5 per cent. with gelatine or agral I was non-fungicidal and non-injurious to the leaves.

Solutions of potassium and sodium polysulphides of equal polysulphide sulphur content had a similar action on the fungus. When solutions of calcium, sodium, and potassium polysulphides of equal polysulphide sulphur content were applied with 0·5 per cent. agral I a more pronounced fungicidal action was noted than

when they were used with 0·5 per cent. gelatine or 0·5 per cent. soft soap.

From these results it is concluded that the fungicidal activity of sulphur in the form of sulphite sulphur, hydrosulphite sulphur, sulphoxylate sulphur, thiosulphate sulphur, or monosulphide sulphur is inadequate to account for the fungicidal properties of finely divided elementary sulphur [see preceding abstracts]. The fungicidal properties of solutions of sodium sulphide, sodium hydroxide, and sodium carbonate result from the alkalinity of the sprays; the hydrogen sulphide liberated from the sodium sulphide solutions used has no effect on *S. humuli*. The active fungicide produced by the hydrolysis of sulphur is sulphur in polysulphide form. That agral I promotes the fungicidal activity of elementary sulphur may, it is considered, be due to its enhancement of the fungicidal action of sulphur in polysulphide form. The direct fungicidal action of polysulphide solutions is due to the polysulphide sulphur as such.

STREETER (L. R.), MADER (E. O.), & KOKOSKI (F. J.). **The adherence of copper dusts to foliage.**—*Phytopath.*, xxii, 7, pp. 645–650, 1 graph, 1932.

Experiments were conducted at Cornell University, New York, to determine the effect of moisture and time of application on the adherence of copper dusts to potato leaves [cf. *R.A.M.*, vi, p. 313]. The preparations, containing 81 parts of hydrated lime and 19 of copper sulphate monohydrate, were applied to both dry and moist foliage on various dates and times of day in July and August.

The results of the tests [which are tabulated] showed that the presence of moisture on the leaves is essential to good adhesion of the copper-lime dust, the adherence of the copper being closely correlated with the presence of dew. The lack of adhesion in the absence of moisture is attributed (on the basis of laboratory tests) to the conversion of calcium hydroxide to calcium carbonate, so that a good adhering film is not formed. The process of conversion may occupy periods ranging from a few hours to several days according to temperature and humidity, but under normal midsummer conditions it is likely to be rapid.

TISDALE (W. H.). **Ethylmercury compounds as agricultural disinfectants.**—*Indus. & Engin. Chem.*, xxiv, 7, pp. 745–747, 2 figs., 1932.

A summary is given of the various agricultural uses to which certain antiseptic ethylmercury compounds have been put of recent years in the United States, e.g., as seed-grain, cotton, and vegetable disinfectants, and in the control of sap stain or blue stain of timber [*R.A.M.*, x, pp. 225, 355, 356, 766; xi, p. 491]. Most of the work described has already been noticed from other sources.

CADORET (A.). **Le pulvérisateur à jet sphérique.** [Spherical spraying nozzle.]—*Prog. Agric. et Vitic.*, xcvii, 25, pp. 604–605, 1 fig., 1932.

The spraying nozzle very briefly described in this paper consists

of a hollow copper sphere provided with one apical and four lateral spraying vents, each giving a fan-shaped jet. This nozzle, which may be adapted to any hand or mechanically driven sprayer, is claimed to be particularly useful for spraying grape bunches hidden among thick foliage, which usually are not reached by sprayings done with the ordinary nozzle now in common use (Riley nozzle) [cf. *R.A.M.*, x, p. 773 ; xi, p. 153]. As recommended by the author, in vineyards where the foliage is dense each spraying should be done in two rounds, the first consisting of the ordinary application of the spray to the foliage, and the second, coming immediately after the first, consisting of the special bunch spraying with the new nozzle which should be thrust into the midst of the stock and kept there from 2 to 3 seconds. The nozzle should also be useful for spraying fruit trees.

GLENNIE (AGNES E.). **Index to the literature of food investigation.**—Published by Dept. Sci. & Indus. Res., Food Invest. Board, London, iii, 1, iv + 167 pp., 1931 ; iii, 2, iv + 183 pp., 1931 ; iv, 1, iv + 135 pp., 1932.

These are three further numbers of the annotated bibliography of current English and foreign publications of interest to those concerned with problems of food research (including spoilage and preservation) which is issued at intervals by the Low Temperature Research Station, Cambridge [cf. *R.A.M.*, x, p. 328]. The first part of volume iv contains a brief review of noteworthy developments in the subject during 1930–1.

KÖCK (G.). **Die Bedeutung der kulturellen Bekämpfungsmethoden im praktischen Pflanzenschutz.** [The importance of cultural control methods in practical plant protection.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz,* xlii, 7–8, pp. 383–389, 1932.

In the writer's opinion, the current tendency in plant protection is to emphasize the chemical methods of control at the expense of cultural and biological practices, e.g., intensive soil cultivation, adjustment of harvesting time, crop rotation, and manuring, some general observations on which are made with a view to their wider adoption.

RIVERS (T. M.). **The nature of viruses.**—*Physiol. Reviews* (*Amer. Physiol. Soc.*), xii, 3, pp. 423–452, 4 diags., 1932.

This is a survey of recent literature on various aspects of the virus problem, including dimensions, purification, cultivation, metabolism, and adaptation of the viruses, inclusions, the viruses as filterable forms of bacteria, the effect of physical and chemical agents on viruses, spontaneous generation of viruses, immunity, and concepts of the nature of viruses. In the author's opinion, the nature of these active agents cannot be definitely determined in the present confused state of knowledge, though the simplest explanation, based on presumptive evidence, is that they are infinitely small living organisms.

MacClement (D.) & Smith (J. H.). **Filtration of plant viruses.** —*Nature*, cxxx, 3273, pp. 129–130, 1932.

The writers have examined the filterability of a number of plant juices containing viruses by means of graded collodion membranes prepared according to the technique of W. J. Elford. It was found that there was a rapid clogging of the pores, especially of the finer membranes, notwithstanding thorough preliminary clarification by passage first through paper pulp and then through a coarse membrane (0·6 or 0·7 μ). With some plants, e.g., tomatoes of more than a few weeks old, this plugging renders the results useless as a guide to the size of the particles, but in others, e.g., tobacco, this drawback is less pronounced. Possibly this accounts for the fact that the virus does not pass undiminished in quantity through the series of membranes down to a definite pore size, but undergoes a progressive reduction all the way down. For instance, the number of spots developing on *N[icotiana] glutinosa* leaves after passage of paper pulp was 407 per leaf; after 0·8 μ 220, after 0·49 μ 38, after 0·25 μ 6, and after 0·1 μ or less no spots occurred. Experiments are in progress for the removal of the clogging material before passage of the membranes.

As in the case of animal viruses, those of plants were found to differ greatly in size. The tobacco mosaic virus (Johnson No. 1) [*R.A.M.*, x, p. 60] passes the 0·051 μ membrane, though in reduced quantity (only four out of eight plants infected), and the 0·154 μ easily. The yellow tobacco mosaic virus (No. 6) is of the same size, passing 0·051 μ (two plants positive out of eight). Aucuba mosaic virus passes 0·120 and 0·112 but not 0·10, 0·06, or 0·051 μ. The virus of a *Hyoscyamus* disease found by Dr. Marion Hamilton passes 0·30 but not 0·234 μ or smaller—a point of some interest as this virus has been shown not to traverse an L. 3 Pasteur-Chamberland porcelain candle, although its pore size is about 2·5 μ.

By Elford's method of calculation, these figures would indicate a particle size of 15 $\mu\mu$ for the tobacco and yellow mosaic viruses, about 40 to 50 $\mu\mu$ for aucuba, and 150 $\mu\mu$ for the *Hyoscyamus* virus. The value found for tobacco mosaic thus comes midway between Duggar's estimate of 30 to 40 $\mu\mu$ and that of Waugh and Vinson (5 $\mu\mu$) [ibid., xi, p. 407].

By the use of these membranes it is possible to separate two viruses occurring together in nature in the same plant. The *Hyoscyamus* virus was passed through a series of membranes, traversing 0·64 and 0·30 μ with characters unchanged; after passage through 0·234, 0·209, and 0·120 μ the disease produced was of a different type. Further investigations showed that the virus passing the smaller membranes is entirely distinct in its properties from the other larger one it accompanied, and that the two may be separated by other methods than filtration.

Labrousse (F.). **Les caractéristiques biochimiques des micro-organismes suivant la composition du milieu.** [The biochemical characteristics of micro-organisms according to the composition of the medium.]—11 pp., Paris, Éditions de la Revue de Pathologie Comparée et d'Hygiène Générale, 1932.

The author's investigations into the biochemical properties shown

by very numerous [unspecified] species of fungi in culture [*R.A.M.*, ix, p. 549] demonstrated that with certain fungi the change effected in the P_H value of the medium by the presence of the organism is conditioned by the nature of the nitrogenous salt present in the medium and may take place in the absence of any fungal development, so that it is evidently independent of metabolism. With other fungi, however, the P_H value of the medium never changes until fungal growth has actually begun, and in this case the change always consists in an acidification of the medium; it is conditioned by the same factors as is the fungal growth, and with any given fungus the P_H value set up varies according to the nature of the carbohydrate present in the medium. Any particular species of fungus belonging to either of the preceding classes will, on any given medium, set up a reaction corresponding to a P_H value characteristic of the species.

None of the fungi which oxidized guaiacol reduced the other indicators, and none which possessed reducing properties oxidized guaiacol [loc. cit.]. Any given fungus was able to reduce only a certain number of indicators whose oxidation-reduction potentials were not below a certain value. As a given series of colouring agents became increasingly difficult of reduction by any given fungus, so they showed a corresponding decrease in oxidation-reduction potentials. All the fungi possessed of reducing properties were able to reduce cresyl blue; this means that an oxidation-reduction potential of +0·033 volts was set up in the medium. A certain number of fungi reduced neutral red, which implies an oxidation-reduction potential of −0·32 volts.

The author considers that these oxidation-reducing properties result from the production at the expense of the constituents of the medium of certain substances possessed of oxidation-reducing properties towards the indicators. These properties become evident only when fungal growth actually begins, and therefore they cannot be explained on any basis of 'activation phenomena' of the type that Quastel suggested in the case of the non-proliferating bacteria. The precise mechanism involved is being investigated by exact analysis of the substances produced in the media during fungal growth.

Proceeding along these lines the author has succeeded in sketching out the physiological characterization of the species concerned. The value of this was seen in the identification of a *Sclerotinia* through its reducing properties [ibid., x, p. 286].

The very low oxidation-reduction potentials set up in the media in which certain fungi were grown explains why anaerobic bacteria find a very favourable environment in the presence of such fungi.

RABINOVITZ-SERENI (D.). **L'azione dei raggi luminosi visibili di differente lunghezza d'onda sull'accrescimento, sulla sporificazione e sulla pigmentazione dei funghi in coltura pura.** [The action of luminous visible rays of different wave-lengths on the growth, sporulation, and pigmentation of fungi in pure culture.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 1, pp. 81–114, 3 figs., 1932.

Experiments [which are described] in which pure cultures in

Erlenmeyer flasks of *Phytophthora cambivora*, *Epicoccum purpurascens* [*R.A.M.*, xi, p. 638], a *Fusarium* isolated from clover roots, *F. poae*, *Cladosporium herbarum*, *Helminthosporium gibberosporum*, *Sterigmatocystis nigra* [*Aspergillus niger*], *Penicillium crustaceum*, *Clonostachys araucaria*, and *Botrytis cinerea* in various stages of development were exposed to the effects of luminous radiation showed that, with the exception of the clover *Fusarium*, white daylight and incandescent electric light stimulated mycelial growth, sporulation, and the formation of pigment. Red light depressed growth [cf. ibid., xi, p. 564], cultures exposed to it behaving as in the dark, the more sharply refracting rays of the spectrum being absent from the red end of the spectrum. The fungi were not markedly sensitive to the various forms of visible luminous radiation tested (the different colours being obtained by placing the cultures in wooden boxes provided with coloured glass windows), and the stimulatory effect of the more sharply refracting radiations was not distinctly specific. *C. herbarum*, both species of *Fusarium*, *H. gibberosporum*, and *A. niger* remained almost unaffected.

The more sharply refracting rays exercised a specific action on the formation of pigment in those fungi which contained a chromogenous group in the constituents of their cellular content. Yellow and red rays had no inhibiting or retarding influence, the lack of any formation of pigment in the fungi when exposed to them being due solely to the absence of actinic rays just as occurs in the dark. The very slight formation of pigment which, exceptionally, occurred even in darkness showed that the process of oxidation, to which the appearance of the pigment is due, may sometimes take place very weakly even in the absence of the more refracting rays which normally provoke and accelerate the process.

Like the other fungi tested, *B. cinerea* sporulated when exposed to any of the visible luminous rays, but complete absence of light inhibited (completely or nearly so) conidial production. Blue rays had the greatest stimulatory effect on the growth and spore production of *B. cinerea*. In some fungi, e.g., *H. gibberosporum*, luminous radiation slightly reduced spore production.

Rabinovitz-Sereni (D.). **Il grado di resistenza di alcuni funghi all'azione dei raggi ultravioletti.** [The degree of resistance of certain fungi to the action of ultra-violet rays.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 1, pp. 115–144, 5 figs., 1932.

When the conidia of 22 species of fungi were exposed at a distance of 20 cm. to the ultra-violet rays emitted by a quartz-mercury vapour lamp (110 volts, 5 ampères) [cf. *R.A.M.*, xi, p. 166] they exhibited very different powers of resistance, depending on the thickness and colour of the walls and the nature of the cytoplasm; in some instances the resistance appeared to correspond to an adaptation to new conditions of habitat.

Dark, thick-walled conidia, such as those of *Helminthosporium gibberosporum*, *Coniosporium bambusae*, and *Epicoccum purpurascens* resisted the effects of exposure for 180 minutes; slightly olivaceous conidia, such as those of *Microascus stysanus* and *Penicillium crustaceum* withstood exposure for 25 minutes, while

hyaline conidia, such as those of *Clonostachys araucaria*, *Fusarium martii*, and the pycnospores of *Deuterophoma tracheiphila* withstood exposure for only 10 minutes.

The percentage of spores that germinated declined as the exposure was prolonged. The most resistant species tested, *H. gibberosporum*, *C. bambusae*, and *E. purpurascens* still germinated normally after 20 minutes' exposure, but after 22 minutes germination fell to 80 per cent., after 90 minutes it fell to 20 to 40 per cent., and after 185 minutes it was only 1 or 2 per cent.

A bibliography of 27 titles is appended.

MURPHY (P. A.). **A critical review of some recent work on the occurrence of virus complexes in the Potato.**—*Scient. Proc. Roy. Dublin Soc.*, xx (N.S.), 18, pp. 193–210, 1932.

This is a critical discussion of K. M. Smith's recent discovery of the *x* and *y* viruses associated with certain potato diseases of the mosaic group [*R.A.M.*, x, p. 615; xi, p. 394]. While acknowledging the fundamental importance of this discovery, it is argued that the idea developed by Smith that most potato virus diseases are of dual nature (but admitting the possibility of the existence of a third virus in crinkle and streak), and that their constituents are the same throughout, namely, the *y* virus which is stable, and the *x* virus which is variable, is not entirely supported either by his own experimental results, or by the author's work in collaboration with M'Kay, or by Salaman's investigations. In the case of the *y* virus (with which this paper is exclusively concerned), it is pointed out that in Smith's experiments his *y* virus separated from Up-to-Date streak and from crinkle in Myatt's Ashleaf differed from the corresponding virus isolated from a mild mosaic in Arran Victory in the severity of the symptoms caused by it in President potatoes after passage through tobacco [loc. cit.]; this fact leads to the conclusion that Smith's view that the *y* virus is identical in all these three diseases is incorrect and that the virus originating from mild mosaic is not identical with the corresponding viruses from streak and the crinkle, while the identity with each other of the two last-named entities is still open to question. The explanation of this discrepancy may lie either in the fact that the viruses designated *y* from the mild mosaic in Arran Victory and the Up-to-Date streak, respectively, are entirely dissimilar, or that, while they contain a common element, one or other is itself a complex. Evidence is also adduced to show that Smith's analysis of the Up-to-Date streak by passage through tobacco was not primarily concerned with streak, but with a mosaic which is generally (but, as it is believed, not always) associated with it in this variety, and from which the *x* and *y* were in part, at least, derived; in other words, the analysis was concerned with $x+y+Z$ (it is pointed out that this paper was prepared before the publication of Salaman's recent communication [ibid., xi, p. 594], and that the Z used here is merely a designation of a hypothetical virus), and the characteristics given were probably those of $y+Z$. A similar explanation is offered for the fact that the *y* virus from the form of crinkle in Myatt's Ashleaf used by Smith had a more severe effect on President potato than the *y* from Arran Victory mild mosaic. The

crinkle material used by Smith does not appear to have been standard crinkle [see next abstract], and can hardly have been fully identical with the crinkle used by the author [cf. ibid., i, p. 250] and Salaman ('crinkle A') [ibid., ix, p. 603]. This consideration deprives the question of the presence in crinkle of a necrotic *y* virus common to Up-to-Date streak of much of its interest, the more so that the weight of evidence adduced by the author is opposed to the view that this streak has any part in the constitution of standard crinkle.

Attention is drawn to the dangers, as illustrated by this critical review, inherent in attempts to determine the constitution of virus complexes by analysis, since it does not distinguish between a virus present in or with a complex, which is only an accidental or latent superfluity, and a virus which is essential for the production of the symptoms characteristic of the complex. If analysis is made, it must be confirmed by synthesis of the given complex, with the production in the original host, by means of a combination of the smallest possible number of viruses, of a disease recognizably similar to the original complex, and with the same transmissibility and other characteristics. It is pointed out, further, that while tobacco possesses certain advantages for the study of potato viruses, too great a reliance on it, to the neglect of other indicator plants, is likely to lead to confusion, a serious objection being the unexplained changes which certain of the potato viruses or complexes appear to undergo when inoculated into it, and which appear to render it impossible to reconstitute the original potato disease with them.

With regard to Salaman's crinkle A the author goes on to show that the simple or interveinal mosaic secured by Salaman by means of certain methods of inoculation corresponds to simple mosaic, and that his results are readily explicable on the ground that the crinkle is a complex of this disease and another virosis, there being no necessity to invoke the theory of modification of crinkle by dosage.

In a brief reference to the American potato virus diseases [ibid., x, p. 682], it is stated that the viruses present in 'healthy' American potatoes include those of simple mosaic, which apparently has not been described in America, and of streak as in Up-to-Date. American mild mosaic is not identical with simple mosaic, and is more like crinkle. The identity of rugose mosaic with crinkle is uncertain.

Murphy (P. A.) & M'Kay (R.). **The compound nature of crinkle, and its production by means of a mixture of viruses.**—*Scient. Proc. Roy. Dublin Soc.*, xx (N.S.), 20, pp. 227–247, 3 pl., 1932.

This is a detailed account of experiments, repeated three times in different years, the results of which are interpreted as demonstrating the compound nature of the potato crinkle disease [*R.A.M.*, i, p. 250 and preceding abstract]. The material primarily used in the work consisted in an apparently healthy line of the Irish Chieftain variety, which, however, in the very early stages of growth showed faintly visible signs of mosaic and which by grafting transmitted a very faint, but usually recognizable, mosaic

to President and Arran Victory plants. This disease in Irish Chieftain does not appear to have been previously described and, for the sake of convenience, is provisionally termed 'disease A', and the corresponding virus is designated 'virus A' until its constitution and relationships have been more exactly determined. When simple mosaic was introduced into Irish Chieftain naturally infected with this disease, symptoms indistinguishable from crinkle and quite unlike the ordinary simple mosaic were produced, and these symptoms persisted unchanged for at least two or three seasons. When transferred to President this crinkle-like disease again reproduced all the symptoms of crinkle in the majority of cases, but in others a mild mosaic alone resulted, presumably owing to the dropping of one of the constituents in transmission. The crinkle symptoms in President persisted unchanged for at least three seasons. In a few exceptional cases a disease (which has been designated 'sub-crinkle') intermediate between crinkle and simple mosaic was produced in President, indicating that one or more of the viruses that go to make up crinkle is capable of further analysis, and that such an intermediate disease may be the result of the elimination of one of the constituents.

When virus A was introduced into healthy President, after which the plant was inoculated with simple mosaic, typical and persistent crinkle symptoms again developed in most cases and a faint mosaic in others. On inoculation into Up-to-Date plants, the synthetic crinkle produced by the two methods described above gave rise to the typical and fatal effects of natural crinkle.

A combination of virus A and interveinal mosaic produced an aberrant form of crinkle, which may be considered as a variety of this disease. Evidence is adduced to show that the production of a crinkle-like disease when streak from Up-to-Date was combined with virus A was due to a simple mosaic occurring as an impurity in the streak material [loc. cit.], and that this streak has no part in the constitution of crinkle. There was also some evidence that varieties of crinkle corresponding to the artificial combinations described in this paper may occur in nature, and it is pointed out that the disease produced by the combination of standard simple mosaic from Arran Victory with disease A corresponded most closely with standard crinkle as it occurs naturally in Irish Chieftain and other varieties.

The paper terminates with a preliminary discussion of some of the characteristics of the A disease, and of its practical importance.

SALAMAN (R. N.) & BAWDEN (F. C.). **An analysis of some necrotic diseases of the Potato.**—*Proc. Roy. Soc. London*, Ser. B., cxi, B769, pp. 53–73, 2 pl., 1932.

A summarized review of the literature dealing with the group of potato virus diseases to which the term 'streak' has been applied, makes it appear that it may be distinguished into two clearly differentiated clinical states. For the first of these the authors accept Quanjer's designation acropetal necrosis [*R.A.M.*, x, p. 746], synonymous with stipple streak or leaf drop streak; and

for the second, the term acronecrotic necrosis, corresponding to Quanjer's acronecrosis or top necrosis [loc. cit.] and to the streak of some older writers. It is pointed out, however, that these names should only be taken as applying to distinct clinical pictures, and should not imply reactions of specific virus units.

Their investigation of this group of diseases is claimed by the authors to have shown that acropetal necrosis is the distinctive reaction in certain potato varieties of K. M. Smith's *y* virus [see preceding abstracts] and is transmissible both by inoculation and by grafting as well as by aphids. The acronecrotic necroses may be separated into at least four groups on the ground of their varietal reaction; these groups are respectively designated as top necrosis X, top necrosis A, top necrosis B, and top necrosis C. The first three have the common feature that when they produce a top necrosis in any given variety, it is not accompanied by any mosaic symptom, while the last-named differs clinically in that necrotic and mosaic symptoms occur together. Top necrosis X was shown to be caused by the *x* virus acting alone, top necrosis A to be due to a complex containing both *x* and *y*, the *z* virus [ibid., xi, p. 594] being suspected to be also present, top necrosis B to a complex containing *z* and *y*, and top necrosis C to the presence of the *x* and *y* viruses without any evidence of the presence of *z*. The X and C complexes are transmissible by needle inoculation to other potato varieties, the resulting lesion not being necessarily a top necrosis. The B complex is uninoculable by the sap, as is also the A complex, except that the latter can be conveyed to the Arran Crest and Epicure varieties by the needle.

Top necrosis A was found to be carried in a latent condition by certain plants of many of the most widely grown potato varieties in England, such as Arran Banner, Majestic, and Up-to-Date; the last-named, indeed, is rarely to be found without such latent infection. So far the variety Di Vernon alone was found to carry the top necrosis B in the field.

The work is also claimed to have demonstrated that a clinical disease of the mosaic group cannot be defined by the syndrome of its reaction in one particular variety of the potato, but rather by the complete history of the various symptoms caused by it in a large number of varieties, as well as in a certain number of selected species of non-related Solanaceae. It is considered that the aim to be pursued in the study and classification of plant virus diseases should be to find a correct formula in terms of the virus entities concerned for each clinical disease.

BAWDEN (F. C.). **A study on the histological changes resulting from certain virus infections of the Potato.**—*Proc. Roy. Soc. London*, Ser. B., cxi, B769, pp. 74–85, 3 pl., 1932.

As a result of his investigation of the morbid anatomy of potato plants infected with certain virus diseases, the author describes three distinct types of necrosis, each correlated with a definite set of external symptoms [details of which are also given], namely, acronecrosis and acropetal necrosis [see preceding abstract] and leaf roll (Quanjer's phloem necrosis) [*R.A.M.*, x, p. 746]. In acronecrosis, which externally is characterized by a necrotic spotting

of the uppermost leaves followed by a dying of the plant from the top downwards, in the absence of any mottling, necrotic areas were invariably found in the stem. These necroses, which are most severe in the distal portions, originate usually, but not always, in the internal phloem and spread into the surrounding tissues, the first symptom being a thickening of the cell walls of the primary phloem elements, accompanied by a separation of the walls; the intercellular spaces thus formed are filled with a yellowish-brown gum-like deposit. The necrotic process is similar but more pronounced in the phloem parenchyma, frequently causing the complete obliteration of the sieve tubes and the collapse of the companion cells. The cytoplasm may disappear altogether or it may turn into a plastic mass with the same characteristics as the intercellular gum. The necrosis also spreads to the wood parenchyma, which is particularly susceptible to it, the xylem vessels being involved in severe cases. The necrotic process may also originate, though less frequently, in the outer phloem. Necroses, similar in their origin and appearance to those in the stem, are also found in the petioles; frequently they are particularly severe and lead to the death of the corresponding leaf, and the axillary buds also become affected and are ultimately killed. When present in the tubers, the necroses develop essentially in the same manner as those in the stem, and rapidly spread to the storage parenchyma. Cork layers abstricting the necrotic areas are always formed in affected tubers, and are occasionally produced in stems grown at high temperatures.

In acropetal necrosis, the external symptoms of which are a crinkling of the upper leaves and drooping of the lower leaves which remain hanging to the stem, internal necroses are seen in the stem and petioles, and chiefly affect the collenchyma, the vascular tissues remaining normal.

Necroses restricted to the phloem elements and consisting in lignification are produced in plants suffering from leaf roll in the year following that of infection. In no cases were necroses found in the stems or petioles of virus-free potato plants.

VERPLANCKE (G.). **Étude histologique et cytologique des parties aériennes de la Pomme de terre atteinte de ' spindle tuber '.** [An histological and cytological study of the aerial parts of the Potato attacked by spindle tuber.]—*Bull. Soc. Roy. Bot. de Belg.*, lxiv (Sér. II, xiv), 1, pp. 128–176, 3 pl., 1931.

Continuing his earlier investigations into spindle tuber of potatoes in the United States [*R.A.M.*, x, p. 814] the author describes further studies in Maine [which are described and the results of which are tabulated and discussed] to determine whether the cytological and histological changes observed in the tubers [loc. cit.] also affected the other parts of the plant. He found that in all the varieties tested, viz., Green Mountain, Irish Cobbler, Bliss Triumph, and Russet Burbank the disease did in fact modify most of the elements of the tissues of the aerial parts. There was an extension in the length or reduction in the width of the cells, or both took place at the same time, but almost always the length to

breadth ratio was increased. This final elongation was noted especially in the elements of the conducting system.

FERNOW (K. H.) & BLACK (L. M.). **Yellow dwarf in New York State.**—*Amer. Potato Journ.*, ix, 7, pp. 116–117, 1932.

Yellow dwarf of potatoes has been known to occur in New York State since 1917, but not until 1929 did the disease become an important factor in the fields under inspection for seed purposes. Since that date there has been a steady increase in the incidence of yellow dwarf both in seed and table stock. Samples of certified seed, each consisting of 100 tubers, planted at Ithaca in 1929 showed 3 per cent. infection, the corresponding figures for 1930 and 1931 being 9 and 22 per cent., respectively. The outbreaks appear to have been correlated with the high temperature and dry weather prevailing during the two latter seasons. The Green Mountain variety appears to be more susceptible to yellow dwarf than Rural. The disease has recently been experimentally transmitted in the field by stem-grafting. Other States in which yellow dwarf is known to occur include Vermont, Pennsylvania, Minnesota, Michigan, Florida, and New Jersey.

KOSMAT (H.). **Abbau der Kartoffel und Saugkraft.** [Potato degeneration and osmotic capacity.]—*Fortschr. der Landw.*, vii, 15, pp. 395–397, 2 graphs, 1932.

After a brief review of previous investigations on the correlation between potato degeneration and osmotic capacity, the writer describes his laboratory experiments at Vienna with the first and third progenies of Böhm's Allerfrüheste Gelbe and the first and second of Ebstorfer Juliperle from a neighbouring district where deterioration is prevalent.

The tubers were received on 7th November, 1930, and kept until the end of the following February in diffused light at ordinary room temperature. On examination it was found that the second progeny of Ebstorfer Juliperle tended to degenerate, yielding only 81 per cent. of the yield from the first; its osmotic index was 23 as compared with 44 for the first. On the other hand, the first progeny of Böhm's Allerfrüheste Gelbe showed a lesser osmotic index (40) and a lower yield (100) as compared with the third (50·5 and 113, respectively).

GARBOWSKI (L.) & LESZCZENKO (P.). **Sprawdzanie odporności Ziemniaków na raka zemniaczanego, Synchytrium endobioticum (Schilb.) Perc. Sprawozdanie II.** [Potato tests for resistance to wart disease, *Synchytrium endobioticum* (Schilb). Perc. Second report.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz*], 11, pp. 51–76, 1932. [French summary.]

This is a summarized account of the authors' laboratory and field tests in 1930 and 1931 of 93 named potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, ix, p. 802], the later part of the laboratory trials being made by their

improved method of sprout infection with summer sporangia [ibid., x, p. 619]. Of the varieties tested six, namely, Jubel, Lech, Magdalenki, Parnassia, Pepo, and Rosafolia, did not show any signs of infection either in the field or in the laboratory, and are classed as entirely immune from the disease. Nine, namely, Arnika, Erdgold, Hindenburg, Juli, Favorit, Prezydent Narutowicz, Wita, Włoszanowskie No. 12 and Włoszanowskie No. 112, escaped infection in the field but in the laboratory showed a transient form of infection which did not lead, however, to the formation of warts or of winter sporangia in the tubers; for all practical purposes such varieties may also be considered as immune, and their cultivation may be permitted in areas threatened with wart disease, as presenting no danger of soil infection. All the remainder exhibited varying degrees of well-defined susceptibility, but four, namely, Borys, Kuckuck, Lucja, and Topaz showed very faint symptoms of the disease in the field, which might easily have been overlooked in a superficial survey, while they were quite severely attacked in the laboratory tests. The case of these four varieties strikingly illustrates the necessity of checking the results of field trials by the more severe laboratory tests, and also the danger of relying on field tests alone in the approbation of potato varieties as wart-resistant.

[These results are also reported in *Bull, Internat. Inst. Plant Protect.*, vi, 8, pp. 131–132, 1932.]

SHARPLES (A.). **Diseases of Rubber.**—*Malayan Agric. Journ.*, xx, 5, pp. 223–229, 1932.

Brief, popular notes are given of investigations in progress in 1931 on the following diseases of *Hevea* rubber in Malaya, viz., wet root rot (*Ganoderma pseudoferreum*) [*R.A.M.*, xi, pp. 324, 402], the root disease due to *Fomes lignosus* [ibid., ix, p. 740], and mouldy root rot of the tapping panel (*Sphaeronema fimbriatum*) [*Ceratostomella fimbriata*: ibid., x, p. 549]; the only other disease of first-rate importance, *Oidium heveae* [ibid., xi, pp. 401, 469], did not develop in 1931, as the weather conditions did not favour infection. During the first half of the year pink disease [*Corticium salmonicolor*] was troublesome in some parts of North Perak and Kedah.

OGILVIE (L.). **Observations on Hop diseases in Herefordshire and Worcestershire with suggestions for their control.**—*Ann. Rept. Agric. & Hortic. Res. Stat. Long Ashton, Bristol, for 1931*, pp. 139–142, [1932].

As no case of recovery from nettlehead of hops [cf. *R.A.M.*, x, p. 207] has been observed in Worcestershire, growers are advised to grub up the affected plants, this being the only means of eliminating the disease. Attempts to transmit nettlehead by means of the aphis *Phorodon humuli* were unsuccessful. Split leaf [ibid., ix, p. 15], also mainly confined to the Fuggles variety, is extending in the west of England. It spreads in the same way as nettlehead and is probably due to a virus. The plants recover, but never completely, towards the end of the growing period. Persistent roguing is the only way to control the condition.

Brief notes are also given on downy mildew [*Pseudoperono-*

spora humuli], chlorotic disease [ibid., xi, p. 539], and mosaic [ibid., xi, p. 423] of hops.

ATANASOFF (D.), DODOFF (D. N.), KOVAČEVSKI (I. C.), MARTINOFF (S. I.), TRIFONOVA (Mme V.), & CHRISTOFF (A.). Нови паразитни гъби за България. III Приносъ. [Parasitic fungi new to Bulgaria. Third contribution.]—*Yearbook Univ. of Sofia, Fac. of Agric.*, Sofia, x, pp. 341–366, 1932. [English summary.]

In this further annotated list of plant-parasitic micro-organisms stated to be new records for Bulgaria [*R.A.M.*, x, p. 436] the following organisms of economic interest may be mentioned. *Bacillus* (*Erwinia*) *papaveri* Christoff n. sp. was found attacking all the organs of the opium poppy (*Papaver somniferum*), on which it caused brown to blackish-brown spots, and of *P. alpinum* and *P. orientale* on which the lesions had a purplish tinge. The bacillus is a short to moderately long (1 to 3·3 by 0·4 to 0·6 μ), motile, strictly aerobic, gram-negative, non acid-fast, non-sporulating, capsulate rod with rounded ends and with 1 to 10 peritrichial flagella, occurring usually singly but frequently in pairs and rarely in chains. It grew well on all the usual bacteriological media, its optimum temperature for growth being 29° C. with a maximum at 36°. On potato agar it formed hyaline, smooth, slightly raised, round colonies with entire or slightly wavy margins; it coagulates milk, liquefies gelatine, does not hydrolyse starch, forms acids from dextrose and saccharose and basic substances from lactose and glycerine, but does not produce indol or gases, except for faint traces of ammonia. On poppy seeds it was shown to retain its viability for over 20 months. *Bacterium maculicola* [ibid., x, p. 62] was observed forming necrotic spots on the leaves, stems, and the heads of cauliflowers; a study is in progress to determine the real identity of the causal organism.

The other records include *Bact. medicaginis* var. *phaseolicola* [ibid., xi, p. 618] on French beans (*Phaseolus vulgaris*) grown from seed imported from Germany; *Urocystis cepulae* on onion [ibid., x, p. 499]; *U. tritici* on wheat [ibid., x, p. 782]; *Puccinia pruni-spinosae* [ibid., xi, p. 559] in the aecidial stage on *Anemone ranunculoides* and in the uredo- and teleutospore stages on different species of *Prunus*, including plum; *Microstroma album* [ibid., vii, p. 407; x, p. 494] on oak (*Quercus pedunculata*); *Phyllosticta antirrhini* on *Antirrhinum majus* [ibid., vii, p. 723]; *P. cannabis* on hemp (*Cannabis sativa*); *Macrophoma straminella* on rhubarb; *Cytospora capitata* [ibid., v, p. 747] on dead apple buds and twigs; *C. leucostoma* var. *cincta* [ibid., iii, p. 433; v, p. 342] causing the death of peach twigs; *Septoria cucurbitacearum* [ibid, x, p. 296] on vegetable marrow; *S. passerini* [ibid., viii, p. 422] on barley and some wild species of *Hordeum*; *S. tritici* [ibid., x, p. 84], very widespread on wheat, rye, and *Poa pratensis*; *Verticillium albo-atrum* on *Acer negundo*, eggplant, *Capsicum annuum*, tomato, plum, peach, apple, and cotton; *Ramularia cynarae* [ibid., vii, p. 556] on globe artichokes (*Cynara scolymus*); *Fusarium culmorum* [ibid., xi, p. 632] on wheat, tobacco, rice, and French beans; and *F. arthrosporioides* [ibid., iii, p. 202 and above,

p. 709] on rice. The paper terminates with a list of new host plants of parasitic fungi that were recently found in Bulgaria.

HOPKINS (J. C. F.). **A list of plant diseases occurring in Southern Rhodesia. Supplement 2.**—*Rhodesia Agric. Journ.*, xxix, 6, pp. 462–467, 1932.

This further list of some 90 plant diseases (mainly caused by fungi but a few physiological) occurring in Southern Rhodesia [*R.A.M.*, xi, p. 25] includes those that were recorded there from June 1931 to May 1932, and also several fungi that were collected prior to 1926.

MUSKETT (A. E.), CARROTHERS (E. N.), & CAIRNS (H.). **Contributions to the fungus flora of Ulster.**—*Proc. Roy. Irish Acad.*, Sect. B., xl, 2, pp. 37–55, 1932.

This is a list, arranged in systematic order, of 311 species and nine varieties of fungi which are stated to be new records for Ulster, 76 species and one variety of which are new to the fungus flora of Ireland. The hosts and localities are indicated in each case.

ARTHUR (J. C.). **Terminologie der Uredinales.** [Terminology of the Uredinales.]—*Ber. Deutsch. Bot. Gesellsch.*, 1*a* (*Festschr.*), pp. 24–27, 1932.

Commenting on Cunningham's proposed modifications in the terminology of the Uredinales [*R.A.M.*, x, p. 343], the author finds that these do not fulfil the essential requirements of morphological exactitude and lucidity. It is recommended that the terminology suggested by the writer in 1905 (*Bot. Gaz.*, xxxix, p. 219) be retained, with the exception of the term 'uredinium', for which 'uredium' may be substituted. This recommendation, first made in 1931, has been adopted by Clements and Shear in 'The Genera of Fungi'.

SHEN (C. I.). **Species of Pestalozzia and Monochaetia in China. I.**—*Contrib. Biol. Lab. Sci. Soc. China, Bot. Ser.*, vii, 5, pp. 131–141, 2 figs., 1932.

An annotated list is given of eight species and one variety of *Pestalozzia* and two of *Monochaetia* hitherto collected in China. A key to the species is furnished and the spores of each are figured. *P. sinensis* n. sp. is reported on living leaves of *Ginkgo biloba*, *P. gossypii* Hori on living leaves of cotton, and *P. congensis* P. Henn. in round spots on loquat (*Eriobotrya japonica*) leaves.

CURZI (M.). **Studi su lo 'Sclerotium rolfsii'.** [Studies on *Sclerotium rolfsii*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 4, pp. 306–373, 9 pl., 19 figs., 3 graphs, 1 chart, 1932.

In this paper a detailed account is given of a comparative study of two strains of *Sclerotium* isolated, respectively, from China aster (*Aster* [*Callistephus*] *chinensis*) and potato in Italy. On their natural hosts both fungi appeared to be referable to *S. rolfsii*

Sacc. and could scarcely even be regarded as separate strains, but in culture they invariably remained distinct.

The aster strain developed a flocculent, abundantly aerial mycelium with numerous sclerotia which were globose, or often flat or slightly concave (very seldom perfectly spherical), varying from 0·5 to over 3 mm. in diameter, and from chestnut or fuliginous to Isabella or dark grey in colour. When the sclerotia were densely grouped large drops of liquid exuded from them and tinged the mycelium. Stromata were rare and only formed on potato glucose agar at 12° to 15° C. The basidial stage [*R.A.M.*, xi, p. 405] was white, flocculent, aerial, and fugacious. The clavate basidia bore 2 to 4 sterigmata measuring 4 to 5 μ in length, at the tip of which the smooth, hyaline, oval-piriform basidiospores, 5 to 7·5 by 2·5 to 3·75 μ in diameter, arose.

The mycelium of the potato strain was never flocculent, but usually arranged in strands. The numerous sclerotia were almost constant in shape and size (small and almost perfectly spherical) on all media and their colour ranged from brick-red to chestnut. The exuded liquid was almost colourless. The numerous stromata were white or ochraceous, sparse or aggregated in irregular masses. The basidial stage formed a crust-like hymenium. The basidia were clavate, and the smooth, hyaline, globose-piriform basidiospores measured 4·5 to 6·75 by 3·5 to 4·5 μ.

In the aster strain the basidia were free, long, and raised, whereas in the potato strain they were short and thick, forming crusts 50 to 250 μ thick, irregular in shape and measuring up to 15 mm. or more in diameter. The sterigmata of the potato strain were slightly shorter than those of the aster strain. The latter, besides showing more variation in its characters, also saltated more frequently. The variants were quite distinct, having a less abundant aerial mycelium than the parent strain and more regular sclerotia. The variants of the potato organism did not differ materially from the parent, and generally showed a more abundant aerial mycelium, with fewer sclerotia.

When the glucose content of the medium was increased, the sclerotia of the potato strain became proportionately more numerous, but retained their shape and size, whereas those of the aster strain tended to become fewer but larger and to become massed together, while their shape also became increasingly irregular.

The aster and potato organisms were mutually antagonistic, the former inhibiting the growth of the latter while it also developed more sclerotia and more basidial fructifications in the line of demarcation. The antagonistic effect of the aster strain was also exerted on certain foreign strains received by the author as *S. rolfsii* and *S. delphinii*, though no such effect was exercised on *Corticium centrifugum* [ibid., xi, p. 539], received from Japan, and only a very slight one on a strain of *S. rolfsii* from Alabama and another from Illinois. All these foreign strains had many vegetative characters of the mycelium and sclerotium in common with the Italian aster strain.

In ordinary media rich in nutrients and at an air temperature of 15° to 25° the basidial stage appeared after about a month in the aster strain, the hymenial plaques of the potato strain forming

15 to 30 days later. In media poor in nutrients abundant sporulation took place after 10 to 15 days at 27° to 28°, in the potato strain only.

The author concludes that his potato strain corresponds with that from which Saccardo described *S. rolfsii*; it cannot be identified with any known Basidiomycete and is accordingly named *C. rolfsii* n. comb., as its sterile form corresponds to the original *S. rolfsii*. *C. centrifugum* cannot be regarded as the perfect stage of the true *S. rolfsii*. The aster strain differs from Saccardo's original *S. rolfsii* and from *S. delphinii*, but is very close to Wolf's and Stevens's strains of *S. rolfsii* [cf. ibid., x, p. 693], and should probably be considered as specifically identical with them, and distinct from the typical *S. rolfsii* and *S. delphinii*; it shows many affinities with *C. centrifugum* and other fungi of the same group.

The name *S. rolfsii* is thought to include more than one *Sclerotium* whose systematic position should be cleared up by a search for the perfect stage or an accurate study of the vegetative organs under various environmental conditions. Such a study should be based on the characters of the mycelium rather than on those of the sclerotia, as has been the case hitherto.

CURZI (M.). **Contributo alla conoscenza della biologia e della sistematica degli stipiti dello 'Sclerotium rolfsii'.** [A contribution to the knowledge of the biology and systematics of the strains of *Sclerotium rolfsii*.]—*Rendic. R. Accad. Lincei*, xv, Ser. VI, 3, pp. 241–245, 1932.

In continuation of his earlier paper describing the two strains of *Sclerotium rolfsii* isolated in Italy from potato and aster [see preceding abstract] the author states that though Wolf's American strain is usually regarded as a typical strain of *S. rolfsii* it resembled in its mycelial characters more closely the strain isolated from asters in Italy. In the perfect stage (which developed shortly after the earlier paper had been sent to press) the hymenium of Wolf's strain was never a dense crust as in *Corticium rolfsii*, but loose and markedly aerial, more so, even, than the hymenium of the aster *Corticium* with which it agreed in the characters of the basidiospores. Between the last-named and Wolf's strain there was also a noticeable difference in the size, colour, and variability of the sclerotia. In the American strain they were usually small, frequently smaller than in the author's potato strain, but they tended to become aggregated and showed other characteristics in common with the aster organism. Further, from a discontinuous variation sector of the aster organism the author isolated a variant with a shorter aerial mycelium and more numerous, smaller, and more regular sclerotia than those of the parent strain. The author considers that there is evidently a close relationship between the aster *Corticium* and Wolf's strain, but his observations demonstrate the inexactitude of the views of those workers who base the taxonomy of *Sclerotium* species on the shape and size of the organs of conservation.

The study of these sclerotial fungi indicates that there are several distinct species confused under the common name *S. rolfsii*. Those that he examined fall into three distinct groups having as

type strains (1) the sclerotial stage of *C. rolfsii* (Sacc.) Curzi, (2) the sclerotial stage of *C. centrifugum* (= *S. centrifugum* n.comb.), and (3) *S.delphinii* Welch. Wolf's strain is placed in the second group. The salient characters of each group are given, and the strains falling into it listed.

GADD (C. H.). **Report of the Mycologist.**—*Tea Res. Inst. Ceylon Bull.* 8 (*Ann. Rept. for the year 1931*), pp. 16–19, 1932.

Experiments were conducted to test the efficacy of ferrous sulphate in the control of *Poria hypolateritia*, the causal organism of the most prevalent up-country root disease of tea in Ceylon [*R.A.M.*, x, p. 759]. The fungus was able to grow in Petri dishes on a medium containing amounts of the compound equivalent to 2½ tons per acre incorporated to a depth of 9 inches, so that control on these lines is hardly to be expected.

The 'bitten off' disease of tea seedlings appears to be usually associated with a neutral or alkaline condition of the soil [ibid., vii, p. 746], and is most frequently observed in nurseries on the sites of old coolie gardens. In one case tea showed 'bitten off' symptoms after planting out in a field in which the soil was decidedly alkaline.

Little progress has been made in determining the cause of the 'witches' broom' disease of tea [ibid., x, p. 760], which does not appear to be due to a parasite and is not so readily transmissible as a virus disease.

Several cases were investigated in which small areas of tea died suddenly, as though from a root disease. At first a few bushes wilt and die, followed later by as many as a hundred surrounding ones; after a few weeks the spread ceases and no further losses occur. Isolation trenches often failed to arrest the advance of the disease. No external fungus could be found on the roots, the cortex of which appears to be healthy except for long, narrow streaks and dark brown or chocolate-coloured circles with definite boundaries, sometimes penetrating the wood for a depth of 1 to 2 mm. No definitely parasitic organisms were detected in the root tissues, and the trouble is believed to be of physiological origin. Lightning was suspected to be the cause of this condition, and investigations in a few cases where the bushes were known to have been struck by lightning revealed symptoms similar to those described above, the bushes at the margin of the affected area being affected later than those near the centre.

Several cases of leaf disease of *Crotalaria* spp. due to *Parodiella grammodes* [ibid., x, p. 79] were reported during the year. Marked differences in the reaction of individual plants to the fungus were observed. Diseased plants should be eradicated and burnt.

THUNG (T. H.). **De huidige stand van het Phytophthora vraagstuk in de Vorstenlanden.** [The present status of the *Phytophthora* problem in the Vorstenland.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 74, 50 pp., 21 figs., 1 diag., 1932. [English summary.]

In this full account of the present position of the practical knowledge of the 'lanas' disease of tobacco (*Phytophthora*

nicotianae) [*P. parasitica nicotianae*] in the Vorstenland district of Java [*R.A.M.*, xi, p. 334], it is stated that in consequence of the systematic disinfection of the 'dessa' manure by the application of carbon disulphide, or by stacking the fresh manure in heaps and leaving it to ferment [ibid., viii, p. 270], the main source of infection (contaminated manure from the native villages) is excluded and attacks are generally less serious. They do occur annually, however, on plantations in elevated situations with much water (irrigation or rain), infected silt being carried by the latter and distributed over the beds. The infection has been shown to come not only from water contaminated by the 'dessa' manure but also from that from the old tobacco fields and from the drainage water around the curing barns. The presence of the fungus is readily demonstrated by soaking leaves of susceptible tobacco in the water passed through the suspected material as well as by growing seedlings in it. The fungus grows readily on organic débris of all kinds and can multiply in the soil in the presence of any kind of plant remains if there is sufficient moisture. Soil disinfection experiments with lime and ammonium sulphate as recommended by Raciborski, formalin, sulphuric acid, and terbolan (1·5 per cent.) gave promising results.

Other methods of control should include the burning of diseased tobacco stalks; piling up the tobacco fruits and tops collected in the barns for compost; drying the stalks in the barns before distribution to the natives; and the disinfection of furnaces and barn floors.

THUNG (T. H.). **Smetstof en plantencel bij enkele virusziekten van de Tabaksplant.** [Infective principle and plant cell in some virus diseases of the Tobacco plant.]—*Handelingen 6de Nederl.-Ind. Natuurwetensch. Congr., 1931*, pp. 450–463, 1 pl., [? 1931. Received August, 1932.]

The author separated the infective agent of the white or whitish-yellow mosaic of tobacco from a plant which was also infected by the common mosaic as well as by ring spot. It is thought that the first-named, which occurs sporadically in Java, is probably the same as Johnson's and McKinney's yellow mosaic [*R.A.M.*, vi, p. 501; ix, p. 260; x, pp. 60, 410], and in accordance with the nomenclature of the former investigator it is termed 'virus VI', the common mosaic being 'virus I'. Both these were found to be readily transmissible by rubbing the leaves so as to break the hairs with a little of the sap of a diseased plant.

The first symptoms of white mosaic developed on tobacco plants five days after inoculation, the top leaves showing a light yellow coloration of the veins, while the inoculated leaf developed small yellow spots. White streaks also developed on the stem, especially the younger part. The youngest leaves became partially chlorotic, while the full-grown ones eventually developed yellow zig-zag lines along the veins. Microscopic examination showed that the cells underlying the white areas were devoid of chlorophyll, but this condition was purely temporary, the normal green coloration soon spreading over the affected parts. Topping the diseased plants resulted in complete recovery, except in the case of very

young individuals, the assimilatory functions of which were too much impaired by infection to be restored. When the top of a diseased plant is shaded and the older leaves are exposed to the light and allowed to continue assimilation, the new foliage assumes a different aspect from that of a normally growing infected top, being characterized by a uniformly green foundation with a few isolated yellow spots. The infective principle itself, however, undergoes no change, inoculations with sap from the diseased areas producing the typical symptoms.

The virus was found to be present in all the leaf tissues, even those fully matured at the time of inoculation, and shortly afterwards it was detected in every organ of the plant. It would appear that the virus must eventually be reproduced in every part of the living protoplasm and actually becomes incorporated with it. This theory is further supported by the fact that when the sap of the common and white mosaics is mixed in equal parts, the symptoms of both diseases develop independently in inoculated plants, and the infective principles of each are separately recoverable. In this case, apparently, only one of the viruses is reproduced, either because one reaches a particular group of cells before the other and multiplies to the exclusion of the latter, or on account of some agency in the cells which neutralizes the action of one virus and promotes that of the other. A certain antagonistic action must in any case be admitted to exist between a cell in which one of the two viruses is completely reproduced, and the second virus. This was demonstrated by inoculating a plant already suffering from white mosaic with the common type, the symptoms of which failed to develop. Inoculations with the sap of the twice infected plant produced only white mosaic in healthy individuals, showing that the virus of the common type was not even present in a latent condition. Similarly, plants affected by common mosaic fail to contract the white type on inoculation.

The infective principle of white mosaic is not transmissible by the seed to the progeny of a diseased plant, but it is probably present in the seed coat, since healthy plants infected with finely ground seed of plants with common or white mosaic contract the typical symptoms. Here also it would appear that only one virus is capable of reproduction, since plants inoculated with a mixture of diseased seed (common and white mosaic) showed exclusively the latter symptoms.

From the results of his researches the author inclines to the view that the tobacco mosaic virus is not a living autonomous organism, but rather, as held by Hunger (*Zeitschr. für Pflanzenkrankh.*, xv, [p. 257], 1905), a dead toxic substance constantly present in the cells but normally exerting no influence on the plant.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 3, pp. 75–121, 1932.

Spain. On pp. 118–120 it is stated that from 21st November, 1931, consignments of mushroom [*Psalliota campestris*] spawn entering Spain must be accompanied by a duly authenticated certificate vouching for the facts that the manure used for the

cultures was sterilized (method to be stated), that the spawn is derived from pure cultures, and that the products are free from infectious diseases.

As from 24th April, 1932, all living plants and plant products imported into Spain must be accompanied by properly authenticated certificates guaranteeing the absence in the exporting territory in respect of imports of the specified host plants of the following diseases: *Guignardia bidwellii* on the vine, *Endothia parasitica* on chestnuts, *Diaporthe perniciosa* on fruit trees, *Synchytrium endobioticum* on potatoes and other Solanaceae, *Thielaviopsis* [*Ceratostomella*] *paradoxa* and *Fusarium* on bananas and pineapples, *Ascochyta chlorospora* on almonds with shells, *Graphium ulmi* on elm seedlings, cuttings, and branches, *Corticium salmonicolor* and *C. koleroga* on orange and other citrus fruits, *Bacillus amylovorus* on pears, apples, quinces, and other susceptible fruits, *Phyllosticta solitaria* on apples and other species of *Malus* [*Pyrus*], *Neofabraea malicorticis* on apples, pears, and quinces, and *Gymnosporangium juniperi-virginianae* on apples and *Juniperus virginiana.*

Ministère de l'Agriculture. Arrêté concernant le 'bunchy top' du Bananier. [Ministry of Agriculture. Decree respecting 'bunchy top' of the Banana.]—2 pp., 1932.

By a Decree of 18th June, 1932, the Egyptian Ministry of Agriculture declares the bunchy top of bananas to be a harmful disease within the meaning of Law No. 16 of 1916 concerning harmful diseases of fruit trees, and prohibits the transport, by rail, river, or air, except by special permit of the Ministry, of bananas and their foliage from the region lying between the Mediterranean Sea and the southern boundary of the Markaz du Guizeh to any other portion of Egyptian territory, all of which is declared to be infected. All the region south of the Markaz du Guizeh is declared to be in process of eradication of the disease, and all banana trees and their shoots found infected by bunchy top must be washed with paraffin, removed, and burnt.

United States Department of Agriculture. Plant quarantine and control administration. Modification of quarantine on account of the Citrus canker and other Citrus diseases.—1 p., 1932.

From 1st July, 1932, the seeds of citrus fruits will not be subject to the provisions of Quarantine No. 19 [*R.A.M.*, i, p. 367], since it has been ascertained that they may be freed from infection by *Bacterium* [*Pseudomonas*] *citri* by treatment with hydrogen peroxide. Such seeds, therefore, will automatically come under the provisions of Quarantine No. 37 (regulations 3 and 9) whereby the entry of citrus seeds free from pulp is permitted at specific ports, subject to disinfection under departmental supervision.